JOURNAL

OF THE

Rhode Island

INSTITUTE OF INSTRUCTION.

Vol. II. PROVIDENCE, September, 15, 1847. No. 5.

SCHOOL-HOUSES.

A new edition of the document on School-houses, printed with the Report of the Commissioner of Public Schools, in the first volume of this Journal, having been called for, will soon be published, with plans and descriptions of several new houses, and with cuts illustrating recent improvements in the construction of seats and desks, and in the ventilation and warming of school-rooms. That the subscribers to the present volume of the Journal may have the benefit of the new edition of that document, we shall devote this number to the additional matter to be contained in that edition. We shall issue at this time only the first sixteen pages of Number 5, and shall forward the remaining pages after receiving several additional cuts to illustrate the recent improvements in ventilation, introduced into the school-houses of Boston.

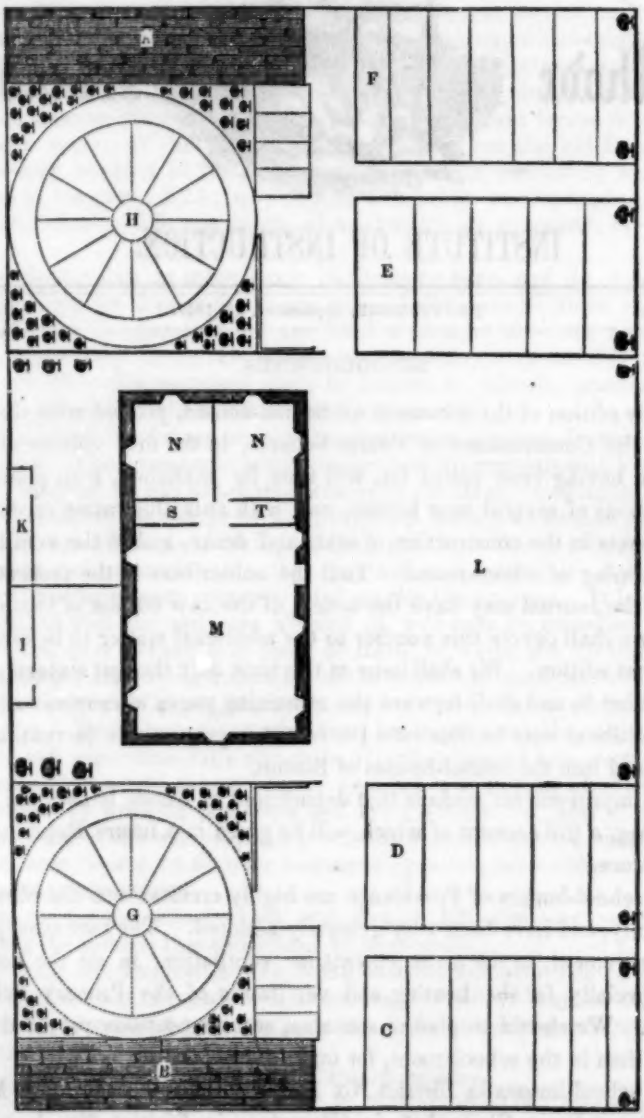
The improvements made in this department in Rhode Island, are most gratifying, a full account of which will be given in a future Report to the Legislature.

The school-houses of Providence are highly creditable to the liberality of the city, and have been very generally admired. They are susceptible of improvement, in the arrangements for ventilation, in all the houses, and especially for the heating and ventilation of the Primary School-houses. We should be glad to see also, accommodations provided elsewhere than in the school-room, for outer garments, &c.

The school-houses in District No. 1, in Portsmouth; at Carolina Mills, in Richmond; at Chepachet, in Glocester; in District No. 1, and at Centre Mill, in North Providence; at Smithville, in Scituate, are worthy of examination by committees who are looking for plans for the internal arrangement of school-houses.

Plan of School-room and Grounds for a Village School.

The following sketch by Dr. Dick, (author of *Mental Illumination*), of the plan and accommodations of a Village School is copied from the *Pennsylvania Common School Journal*, vol. 1, p. 120.



A. B—Covered walks for exercise in winter and rainy days. C. D. E. F—Plats for flowers, shrubs, evergreens, and a few forest trees. G. H—Circles with twelve compartments each, for a different class of plants. I. K—Yards divided with a wall, with suitable accommodations for either sex. L—Portion of ground, smoothed and graveled for play-ground, with circular swing, &c. M—Room, 50 by 30 feet, and 14 feet high. N. N.—Class-rooms, 18 by 15. S. T.—Closets for apparatus, &c.

Plan, &c., of School-rooms for Schools of different grades and different systems of instruction.

The plans and remarks for arranging school-rooms thus far, are more particularly applicable to comparatively small, or country schools, where the instruction and government is conducted by one teacher, with at most but one assistant. A few remarks explanatory of the terms used by writers on education, when speaking of systems of organization and instruction, may be useful to a full comprehension of the principles of arrangement embraced in the plans which follow.

1. The *individual* method is the practice on the part of the teacher, of calling up each scholar by himself for recitation, or giving instruction to each scholar in his seat, or calling up classes and hearing each scholar individually, which is practically the same thing. This method will answer a valuable end in a very small school, and must be introduced to some extent in our small country districts where there are children of every age, and in a great variety of studies, and of different degrees of proficiency in each study. It prevails, however, altogether too generally, even in larger districts which admit of a classification of children into schools of different grades, and of the children in each grade of schools. This classification is the first great step towards school improvement.

2. In the *simultaneous* method, the whole school, together, or in successive classes carefully arranged according to their intellectual proficiency, is instructed directly by the teacher. Questions and explanations are addressed to the whole school, or the whole class, as the case may be, and answers are given by all together, or by some one pointed out by the teacher, while all must show by some silent sign, there ability to do so. This method keeps every mind attentive, gives confidence to the timid, admits of the liveliness of oral and interrogative instruction, economizes the time and labor of the teacher, and enlists the great principle of sympathy of numbers engaged in common pursuit. The extent to which this method can be properly carried, will depend not so much on the size of the schools, as on the fact that the school is composed of children in the same studies, and of the same proficiency. This method ought not to exclude entirely individual instruction.

When the number of children increases beyond that which one teacher can conveniently instruct together, or in successive classes, he must adopt the monitorial, the mixed, or the Fächer system, for such classes as he cannot superintend or teach.

3. By the *monitorial* or *mutual* method, is understood the practice of employing the advanced pupils, and many of them very young, to assist in the supervision and instruction of the school, or of particular classes, as systematized by Mr. Lancaster, or Dr. Bell, and as pursued in the schools connected with the National, and the British and Foreign School Societies, England. This method, in different countries, on its first promulgation, attracted much of public favor, on account of its economy, especially in populous districts. In England it still receives the sanction of the two great Societies named above. In Germany it was never adopted in the public schools. In Holland it was tried, and abandoned, but not without modifying very materially the methods of instruction before pursued, and finally leading to the adoption of the *mixed* method. In the large cities of the United States, it was early adopted, but there is hardly a school in the whole country now conducted on the pure monitorial or Lancasterian system, although there are many so called. As pursued in the excellent schools of the New York Public School Society, it is nearly the mixed method as understood and practiced in Holland, and as recommended by the Committee of Council on Education in England.

With these modifications, and the limitation of the duties of the younger monitors to keeping the registers, heading the classes in marching to and from their class-rooms, or the playground, taking charge of books, &c., and in other matters of order and mechanical arrangements, the monitorial system might be advantageously adopted in schools of every grade, and of any system of instruction.

4. The *mixed* method, as the term is generally understood, is a modification of the simultaneous and monitorial system, in which the principal teacher, while he has the superintendence at all times of the whole school, and gives general instruction at certain hours, and in certain studies, to the whole school, as well as to particular classes, employs in the work of class instruction, assistants who are better instructed, and, as a general rule, are older than those employed as monitors under the Lancasterian system, and are not yet qualified to have the whole charge of a school. For example, in Holland, "every school produces two classes of assistants, who are most usefully and economically employed in aiding him in the management and instruction of the school, and may be called *pupil teachers* and *assistant teachers*. By *pupil teacher* is meant a young teacher, in the first instance introduced to the notice of the master by his good qualities, as one of the best instructed and most intelligent of the children; whose attainments and skill are full of promise; and who, having consented to remain at a low rate of remuneration in the school, is further rewarded by being enabled to avail himself of the opportunities afforded him for attaining practical skill in the art of teaching, by daily practice in the school, and by the gratuitous superintendence of his reading and studies by the master, *from whom he receives lessons on technical subjects of school instruction every evening*. He commonly remains in the school in the rank of pupil teacher from the age of 14 to that of 17, daily imbibing a more intimate acquaintance with school management, and all the matter of instruction in elementary schools, and he then proceeds, by attendance at a Normal school, or by further proficiency attained by his own exertions, to qualify himself to act as an assistant teacher. The assistant teacher prepared by these preliminary studies in the elementary Normal school commences his duties at 18 or 20 years of age.

Assistants thus reared in the atmosphere of schools are exceedingly preferable to the best instructed men who are not familiarized by daily habitude with the minutest details of school management. Such assistants constantly replenish the ranks of the teachers with men, all the hopes of whose youth have been directed towards success in the profession of a schoolmaster, and whose greatest ambition is to be distinguished by the excellence of their schools.

5. The *Fächer* system, as it is termed in Germany where it is most popular, consists in employing separate teachers for separate studies, or as we should apply it here, for distinct departments of government, and of instruction. This is the principle on which instruction in our colleges and most of our higher seminaries is given, and is in reality the mixed method carried to its highest perfection. The vital error in our common schools, as they are now organized, is the practice of employing one teacher for the government and instruction of fifty or sixty children of every age, of both sexes, in a great variety of studies, and in different stages of proficiency in each study. It is very rare to find a teacher with the varied qualifications, which success under these circumstances presupposes, while it is not very difficult to find a teacher with talent and experience sufficient to teach some one study, or a few cognate branches, as an assistant, acting under the general direction of a well qualified principal.

Any school organization and arrangements would be imperfect which did not include the systematic training and instruction of very young children, especially in cities and manufacturing villages. Whatever may have been done by others at an earlier date, it seems to be generally conceded now, that to Mr. Wilderspin belongs the credit of having reduced infant education to the science which it now is. It was unfortunate for the improvement of the quality of education given in our schools, that the infant school system was tried in this country, without a full comprehension of its legitimate principles, methods and end, and that the experiment was abandoned so hastily. Its partial and temporary success, however, led to the extension and improvement of our primary schools, and this circumstance renders the success of any well directed effort for their re-establishment more certain.

Plan and Description of Public School, No. 17, New York.

The following plans and explanation of a "Public School" and a "Primary School" are copied from the "Thirty-ninth Annual Report of the Trustees of the Public School Society of New York." The plans after which the school-houses of this Society were originally constructed, as well as the methods of instruction pursued in their schools, were adopted from those recommended by Joseph Lancaster, and the British and Foreign School Society. These plans and methods have been from time to time essentially modified, until they can no longer be characterized as Lancasterian or Monitorial, but the plans and methods of the Public School Society of New York. There are two grades of schools, the higher called the Public Schools, and the lower, called the Public Primary Schools. Those schools of the primary grade, which are in the buildings appropriated to the higher schools, are designated Primary Departments, to distinguish them from the Primaries taught in separate buildings. The system of instruction pursued in the Primary Departments was originally the Infant School system, and still retains many of the methods of that system. The school-rooms were, therefore, constructed and furnished in reference to simultaneous exercises of the whole school, to oral instruction with visible illustrations, and to physical movements of various kinds.

Public School, No. 17, is in 13th Street, between the 7th and 8th Avenues, on the centre of a lot of ground 100 feet front and rear, by 103½ feet deep. The main building is 42 feet front, and 80 feet deep; the stair building (in the rear,) is 21 by 14 feet. The main building is 49 feet high, from the pavement to the eaves. The first story of the front of the main building is of brown stone, polished, as is also the bases and caps of the pilasters. The walls are all of brick (including the front fences); the front being of (what are called) Philadelphia pressed bricks; the front cornice is of wood, and painted white.

The windows of the lower story, contain each 30, and the two upper stories each 40 panes of glass, 12 by 10 inches: the sashes are all hung with weights and cords, so that they may be raised or lowered at pleasure.

The rooms are all wainscoted, as high as the window sills: the wainscoting, doors, and desks are all grained in imitation of oak: the doors, window casings, and sashes are painted white. The rooms are ventilated by means of six blinds, 2 by 3 feet, being placed in the ceiling between the timbers, and two or three bricks being left out opposite the blinds, in the outside walls.

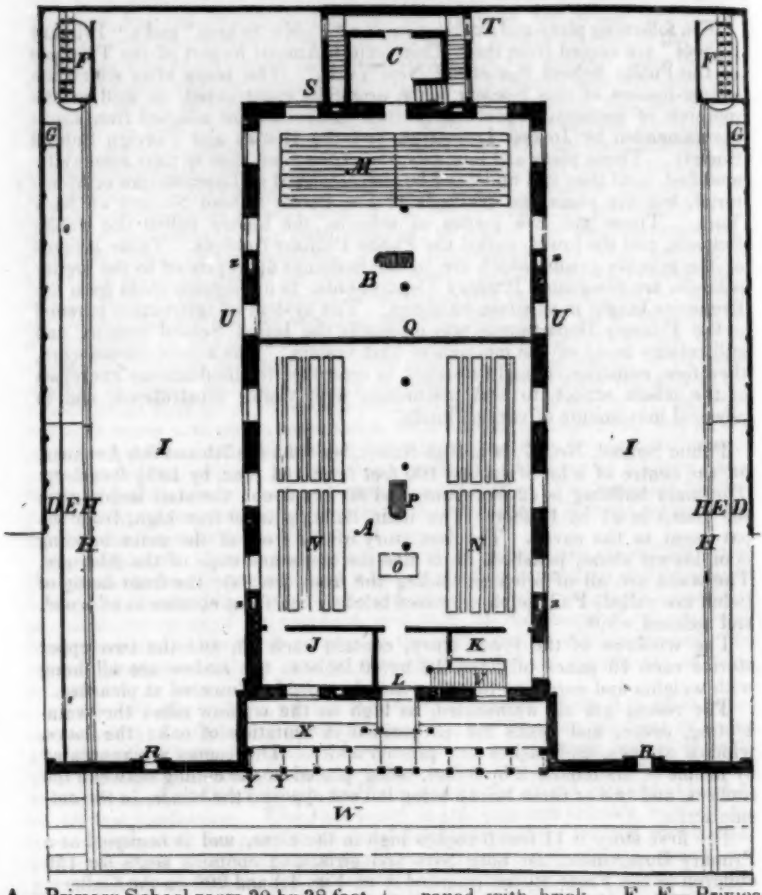
The first story is 11 feet 6 inches high in the clear, and is occupied as a Primary Department, for both boys and girls, and contains seats for 150 children in the Front Room, (marked A on Fig. 1,) and 200 on the Gallery, (marked M on Fig. 1); making in all 350 seats in this department.

The second story is occupied as the Girls' department; the room is 15½ feet high in the clear, and contains seats for 252 scholars.

The third story is occupied as the Boys' department; the room is 16½ feet high in the clear, and contains seats for 252 scholars; making in all 854 seats in the building, exclusive of the seats in the recitation rooms.

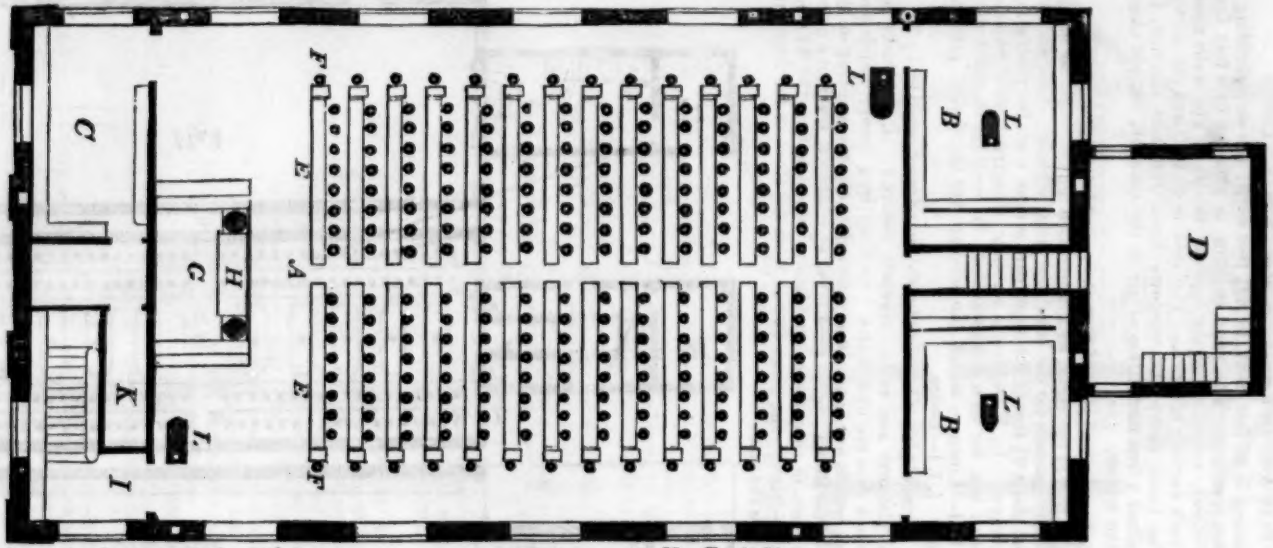
The steps in the stair building, by which the scholars enter and retire from school, are of blue stone, 3 inches thick by 12 inches wide, and are expected to last as long as any part of the building. This method was adopted to avoid the necessity of putting in new steps every few years, (which has heretofore been necessary where wooden steps have been used,) and also to lessen the noise consequent on a great number of children going either up or down wooden steps, at the same time; thus far the experiment has succeeded admirably, and is now adopted for both Public and Primary Schools.

Fig 1. Ground plan of Primary Department, yards, &c.



A—Primary School room 39 by 38 feet.
B—Infant do do 39 by 30 feet.
C—Room for brooms, pails, &c.
J—Boys' ward-robe, 16½ by 8 feet.
K—Girls' do 12½ by 8 feet.
M—Gallery, 32 by 11 feet—Seats for 200 children.
N, N—Desks. each 16½ feet long.
O—Teachers' table.
L—Main entrance.
R. R—Entrance to the yard.
U, U do to Primary department.
V—Stairs to Girls' and Boys' do.
S—Scholars' entrance—Boys' do.
T do do Girls' do.
Q—Sliding doors—28 by 9½ feet.
P, P—Stoves.
Z, Z—Flues for stove pipes.
I, I—Play ground, 102 by 26 feet; paved with brick. F, F—Privies, 12 by 8 feet. G, G—Boxes for sand—3 by 2½ feet.
D, D—Wood-houses—83 by 2½ feet, and 6½ feet high; the front of which is made of hemlock strips, 4 by 2 inches, set perpendicularly 2 inches apart, to allow a free circulation of air.
E, E—Roof of wood-houses—projecting 3½ feet beyond the front of the houses; forming a shelter for the scholars in stormy weather.
H, H—Gutters of blue stone to conduct the waste water from the wood-houses and yards to the street.
X—Court Yard—8½ wide; blue stone flagging. Y, Y—Stone foundation blocks, to which the iron railing in front is secured.

Fig. 2. Ground Plan of the Boy's Department, or third story.



A—School room—55 by 38½ feet.
B, B—Recitation rooms—17 by 13 feet; seats for 50 scholars.
C— do do 16½ by 8 feet; seats for 25 scholars.
D—Receiving room, and scholars' entrance; this room is furnished with a sufficient number of cloak and hat hooks, to accommodate all the scholars, in each department.
I—Front entrance and stairway.
K—Book Closet.
L, L, L, L—Stoves.
G—Platform, raised 1 foot 9 inches above the floor.
H—Teachers' Desk, with a shelf at each end for globes.
E, E,—Scholars' Desks; each 12 feet 8 inches long—19 inches for each scholar.
F, F—Monitors' stations.

The front of the teachers' desk, toward the scholars, is formed by a blackboard 3 feet wide, and extending the whole length of the desk.

Plan &c., of Primary School, New York.

The main building is 25 feet front, by 62½ feet deep: the stair building is 27 feet by 11 feet 8 inches. The main building is placed 6 or 8 feet from the line of the street, according to the depth of the lot. The walls above the ground are built entirely of brick. The roof is of tin; and the gutters of copper. The lower doors and windows have iron bars inserted, for safety, and to admit a free circulation of air in the summer, but are closed with sashes in the winter.

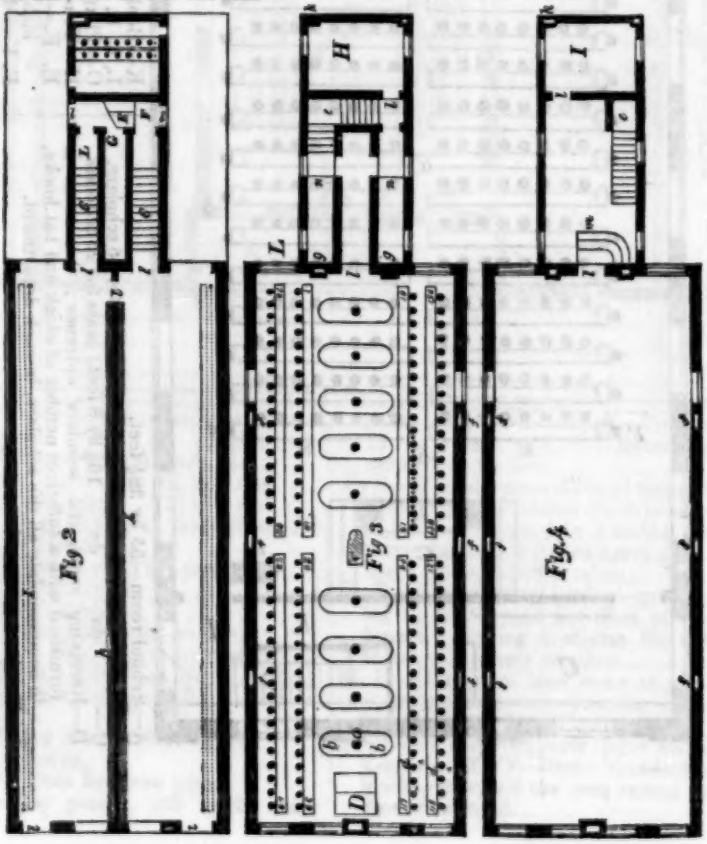
Fig. 1. Ground plan of first story, or play-ground.

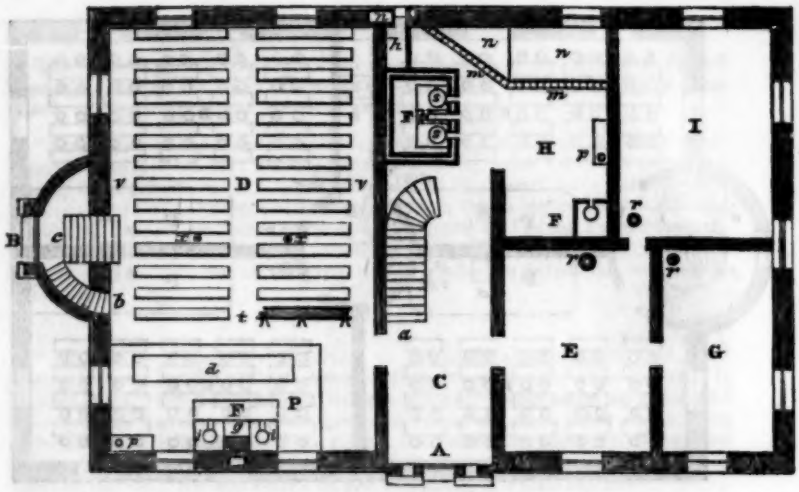
This story is 7½ feet in the clear, with a partition wall through the middle to give separate play-grounds for the boys' and girls' schools. This wall is 8 inches thick; and about 2½ feet of the upper part is open work for ventilation.

C, C — Stairways. L, F — Places for pine (kindling) wood — under stairs. E.—Sand box for both departments. h, h—Piles of wood about 4½ feet high. I, I—Lines on which the scholars are marshaled, previous to entering school. l, l, l—Doors.

Fig. 2 and 3. Ground plan of boys' and girls' department, each 60 by 32.

D—Teachers' platform and table, (movable rollers.) d, d—Desks for scholars—the black dots are iron chairs. a—Cast iron lesson stands—on which two lesson boards are hung, to accommodate classes standing on the line b, b. H—Class Room. g, g, g—Flues, or chimnies, for stove pipes. f, f, f, &c.—Air flues, or recesses for ventilation, extending from the 2d story to the garret. C—Stove—the pipes extend from the stove to the front into the flue, and also to the rear.





No. 15.—Plan of the Basement of High School.

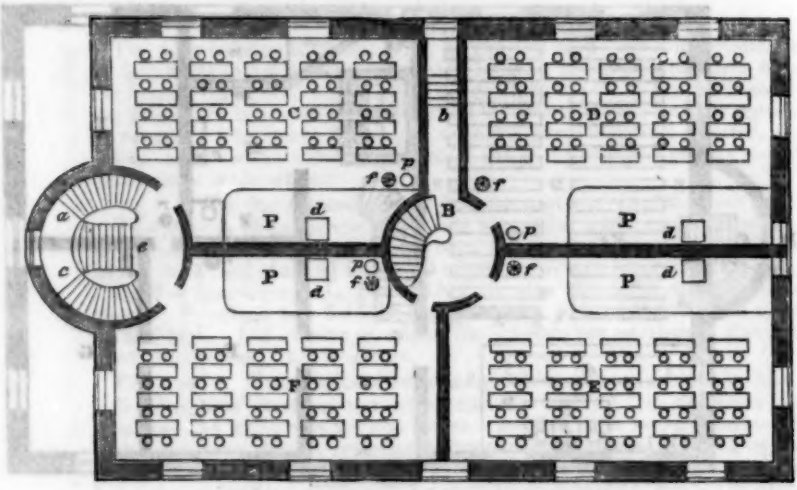
platform [P], raised seven inches from the floor, a long table or counter [*d*], made convenient for experimental lectures in Chemistry, Natural Philosophy, &c., having pneumatic cisterns for holding gasses. At [F, &c.] are suitable provisions for the fires used in the preparations of chemical experiments. The pump [*p*], with a sink like the other, is used exclusively by the pupils in the boys' department.

In all lectures, and other exercises in this room, the girls, entering at [*a*], occupy the seats on the right of [D], the middle aisle. The boys, entering by descending the short flight of stairs [*b*], are seated on the opposite side of the room. This may seem like descending to useless particulars, but it is done to show that there are no grounds for the objections sometimes made against having a school for boys and for girls in the same building, where the departments are kept entirely separate, except in exercises in vocal music and occasional lectures. The boys enter the house at the end door [B], which is six feet above the basement floor, and, by a short flight of stairs, they reach the first story at [*e*].

The three rooms [C, D, F] are appropriated to the department for girls. They are easy of access to the pupils, who, ascending the broad flight of stairs, terminating at [B], can pass readily into their respective rooms.

The course of instruction in the school occupying three years, the room [D] is appropriated to the studies for the first, [E] to those of the second, and [F] to the course for the third year. In each room there are three sizes of seats and desks, and their arrangement in all is uniform. The largest are on the back side of the room. The largest desks are four feet eight inches long, and twenty-two inches wide on the top; the middle size is two inches smaller, and the other is reduced in the same proportions. The largest seats are as high as common chairs, about seventeen inches, and the remaining sizes are reduced to correspond with the desks. The passages around the sides of the rooms vary from two to four feet wide, and those between the rows of desks, from eighteen to twenty-four inches.

On the raised platforms [P, P, P, P] are the teachers' tables [*d*, *d*, *d*, *d*], covered with dark woolen cloth, and furnished with four drawers each. The registers [*f*, *f*, *f*, *f*] admit the warm air from the furnace, and the pipes [*p*, *p*, *p*] conduct it into the rooms in the upper story. The passage [*b*] leads into the back yard, which is ornamented with a variety of shrubbery.

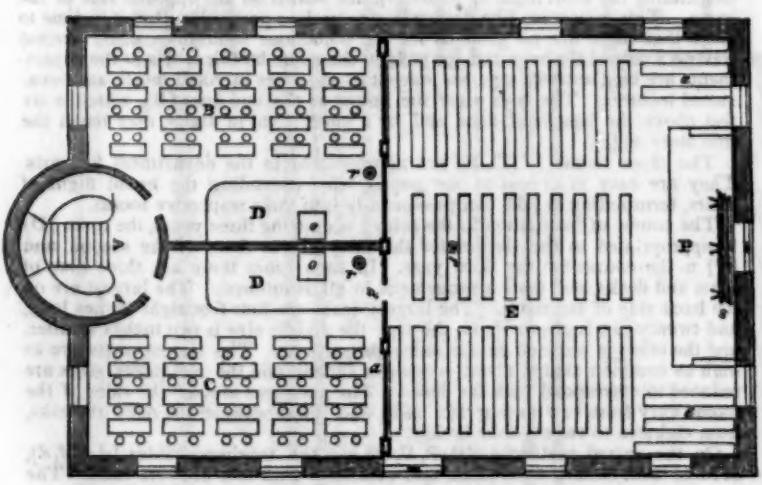


No. 16.—Plan of the First Story of the High School.

The door leading from the room [F] is used only for teachers and visitors, except when the two departments assemble in the hall.

In the room [C] the boys pursue the studies prescribed for the first year; the other rooms in this department are in the next story.

Pupils ascending from the area [*e*], by two circular stairways, land on the broad space [*a*, *c*], from which, by a short flight of stairs, they reach [A], in the following cut, the floor of the upper story, which is sixteen feet in the clear.



No. 17.—Plan of the Second Story of the High School-House.

The following remarks are from the "*Report of the Primary School Committee to the Board of Trustees of the Public School Society of New York, on the use of* SEATS WITHOUT BACKS:—

"On inquiry of the female teachers, several of the oldest and most experienced among them say, that instances of curved spine are often perceived among their scholars. Individual members of this Board have noticed similar instances; and it deserves to be mentioned, that a highly respectable and intelligent foreign gentleman, who is deeply interested in the cause of education, on a late visit to one of our schools, expressed his surprise on perceiving how large a proportion of the girls were round-shouldered and stooping in their figure."

* * * * * * *

"1st. It is a matter of notoriety to the medical profession, that, until about thirty or forty years ago, spinal curvatures were very little known. It is only since "the schoolmaster has got abroad,"—only since so great and universal an impulse has been given to education, that these cases have become sufficiently numerous to attract the particular attention of medical men. There is now to be found a distinct class of practitioners, and of machinists, who live and thrive by the treatment of spinal injuries.

2d. A large proportion of these cases can be distinctly traced to causes connected with school education. Among the illiterate in all countries, these injuries are scarcely known. They occur most frequently in schools where females are much confined to a sitting posture, with but a scanty allowance of those robust and active exercises which impart power to the muscular system, and invigorate the general health.

It should be here explained, that the trunk of the body is sustained in its erect position, solely by the action of muscles. Young and growing females who are but feebly endowed with muscular strength, experience such a sense of weariness in sitting upright, as to be induced, from necessity, to drop the body into a variety of curvatures; and one particular curve becoming habitual and long persisted in, finally ends in permanent deformity. The influence of exercise in preventing the evil, is precisely that which it has on the arm of a blacksmith; it augments the bulk, and redoubles the power of the muscles, and gives greater firmness and security to the joints.

3d. In all large cities there are many children, who, from infancy, are strongly predisposed to these affections, owing to a constitutional feebleness of muscle, or an unhealthy condition of the bones or joints. These require every precaution, during the course of their education, to prevent deformity.

Supposing the females attending our schools to be liable to spinal injuries, are these injuries owing to the use of seats without backs? The answer must be, that they are instrumental in causing them, just so far as they place the scholar under the necessity of seeking relief in the crooked and unhealthy attitudes into which she throws her body. Another question of similar import, is this:—*Would seats with back-supports tend to prevent these injuries?* A similar answer must be given. Such seats would act as a preventive, just in proportion as they removed the temptation and the necessity for indulging in injurious flexures of the body. When we see, as we often may, a girl of rapid growth, of yielding joints, and of feeble muscles, propping the weight of her body on her elbows, or, by way of change, bringing her sides alternately to rest on the desk before her, can we doubt for a moment, that, with a back-support, she would run less risk of injury to her figure? And in regard to those children, before alluded to, as having a natural predisposition to spinal distortions, seats of this kind would be indispensable to their safety."

THE BOSTON PRIMARY SCHOOL CHAIR.

These Chairs were got up for the special benefit of the *Boston Primary Schools*, by JOSEPH W. INGRAHAM, Esq., Chairman of the Primary School Standing Committee; and have already been introduced, by order of the Primary School Board, into the greater portion of their Schools.

The first pattern, is a Chair with a *Shelf* (*s*) under the seat, for the purpose of holding the Books, Slates, &c. of the scholars.

The second pattern differs from the first, in having, instead of the *Shelf*, a *Rack* (A) on the back of the chair, for the same use as the Shelf in the preceding pattern. The third pattern is similar to the second, except that the *Rack* (A) is placed at *the side*, instead of *the back*, of the chair. The latter pattern (with the Rack on the side) is that now adopted in the Boston Schools.

These chairs are manufactured by William G. Shattuck, No. 80 *Commercial Street*, Boston. The price is fifty cents, each, for those with the Shelf, and *sixty-five* cents for those with the Rack.

KIMBALL'S IMPROVED SCHOOL CHAIRS AND DESK.

"These Chairs combine strength, comfort, and style of finish. They are made of different heights, varying from eight to sixteen inches, and for Primary as well as for Grammar and District Schools.

The School Desks are made of Pine, Cherry, or Black Walnut, and of heights to correspond with the chairs. The iron supporters are firmly screwed to the floor, and are braced in such a manner that there is not the least motion."

The above extracts are taken from the Circular of JAMES KIMBALL, 109 or 127 *Essex Street, Salem, Mass.*

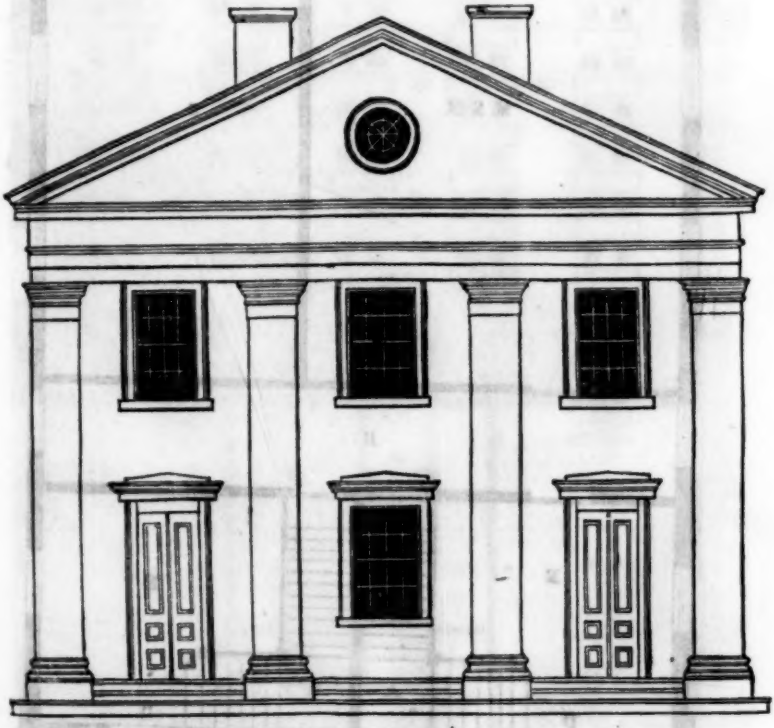
Plans and Descriptions of the Massachusetts Normal School-Houses.

The following plans and descriptions are copied from the "Tenth Annual Report of the Secretary of the Massachusetts Board of Education," with the permission of the Hon. Horace Mann, by whose indefatigable labors these institutions were founded, seconded as his efforts were by the munificent donation of the sum of ten thousand dollars, from the Hon. Edmund Dwight, of Boston.

These buildings were erected partly out of the contribution of $5000, subscribed originally by the friends of Mr. Mann, as a testimony of their esteem for his public services, and, at his suggestion, invested in this way—thus converting these edifices into the monuments of their generosity, and of his self-sacrifice.

Bridgewater State Normal School-House.

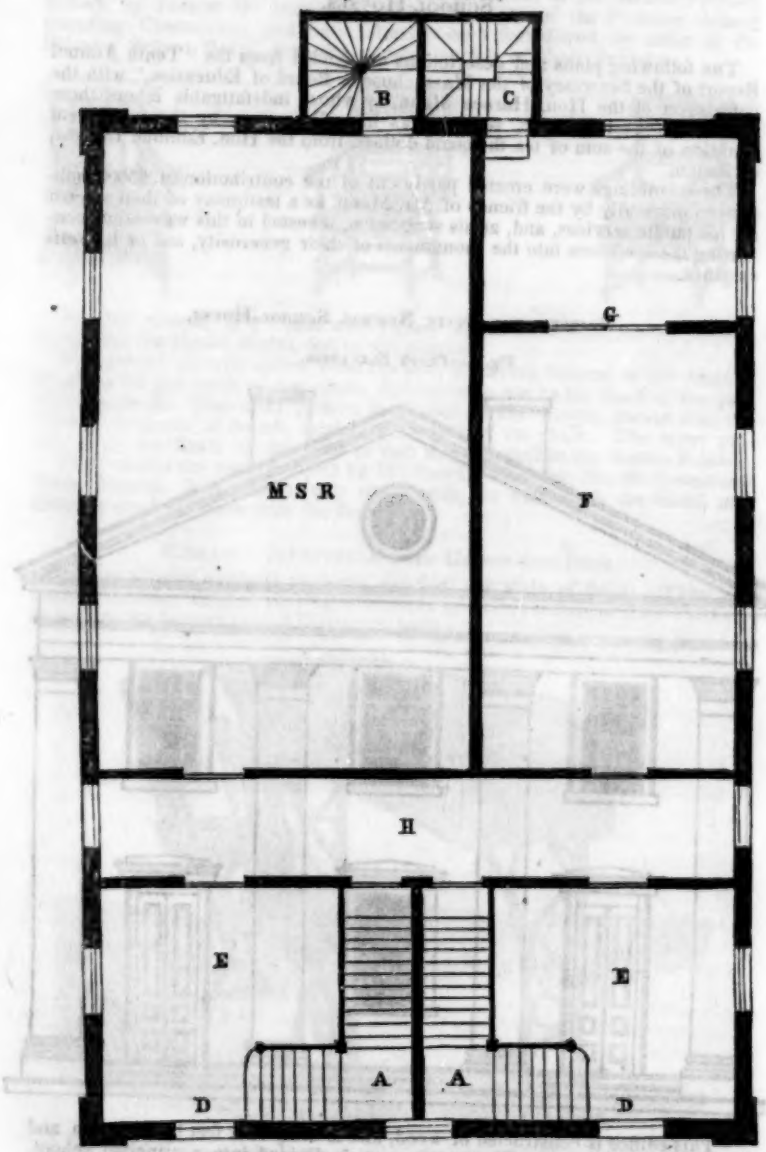
Fig. 1.—Front Elevation.



This edifice is constructed of wood, and is sixty-four feet by forty-two, and two stories in height. The upper story is divided into a principal school-room, forty-one feet by forty, and two recitation-rooms, each twenty feet by twelve, and is designed for the Normal School. The lower story is fitted up for a Model School.

Bridgewater State Normal School-House.

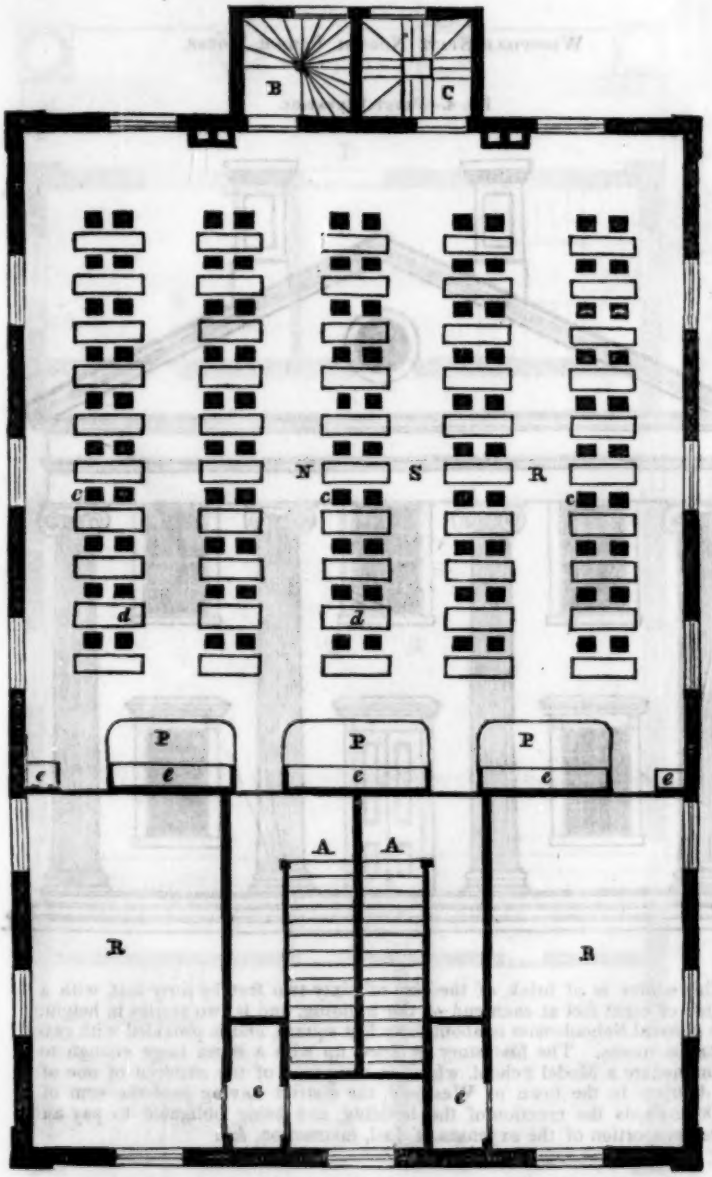
Fig. 2.—Lower Story.



D, D—Doors, one for males, the other for females. E, E—Hall-entries, into which the doors D, D open, 19 feet by 15. A, A—Stairways, leading from the entries to the Normal School-room. M, S, R—Model School-room, 40 feet by 24, with single seats and desks. H—Entry-way, 6 feet 8 inches wide, for Model School scholars. At each end of this entry is an outside door, for the entrance of the Model School scholars—a separate entrance for each sex. G, F—Laboratory and chemical room, or lecture-room, connected by folding doors. The two rooms 40 feet by 16. B, C—Back stairways.

Bridgewater State Normal School-House.

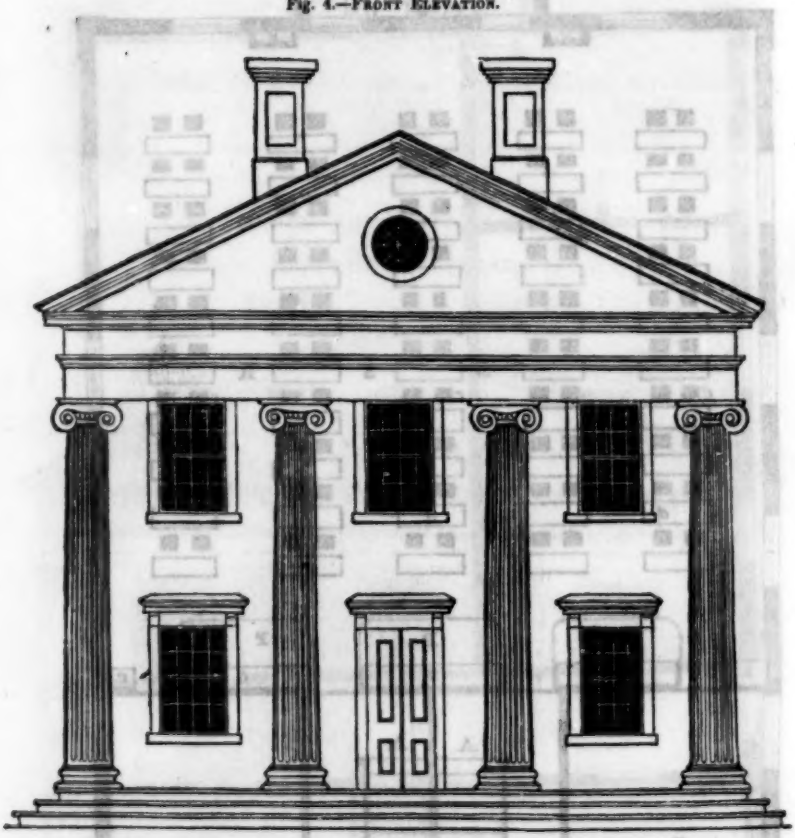
Fig. 3.—Upper Story.



A, A—Separate stairways, for the different sexes, leading from the lower entries, or halls, to the Normal School-room. N, S, R—Normal School-room, 41 feet by 40. c, c, c—Single seats. d, d—Double desks. P, P, P—Teachers' platform. e, e, e, e, e—Behind the platform are recesses in the partition for a library. e, e—Between R, R, are closets for apparatus. R, R—Recitation-rooms, 22 feet by 12. B, C—Back stairways.

Westfield State Normal School-House.

Fig. 4.—Front Elevation.



This edifice is of brick, of the size of sixty-two feet by forty feet, with a portico of eight feet at each end of the building, and is two stories in height. The Normal School-room is about forty feet square, and is provided with two recitation-rooms. The first story is fitted up with a room large enough to accommodate a Model School, which is composed of the children of one of the districts in the town of Westfield, the district having paid the sum of $1500 towards the erection of the building, and being obligated to pay an agreed proportion of the expenses of fuel, instruction, &c.

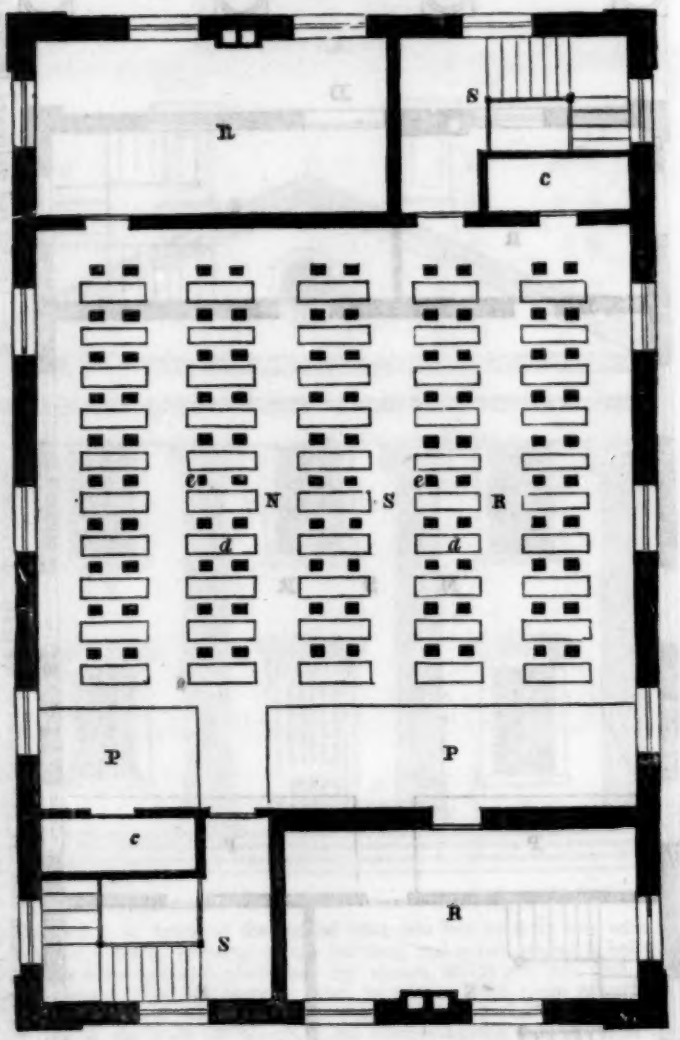
WESTFIELD STATE NORMAL SCHOOL-HOUSE.

Fig. 5.—LOWER STORY.

A, A—Portico of 40 feet by 8, at each end. D, D—Doors, one for males, the other for females. S, S—Entries and stairways, leading to Normal School-room. M, S, R—Model School-room, 38 feet by 37, with single seats and desks. P P—Teachers' platform. R, R—Recitation-rooms, one 15½ feet by 11, the other 17 feet by 11.

Westfield State Normal School-House.

Fig. 6.—Upper Story.



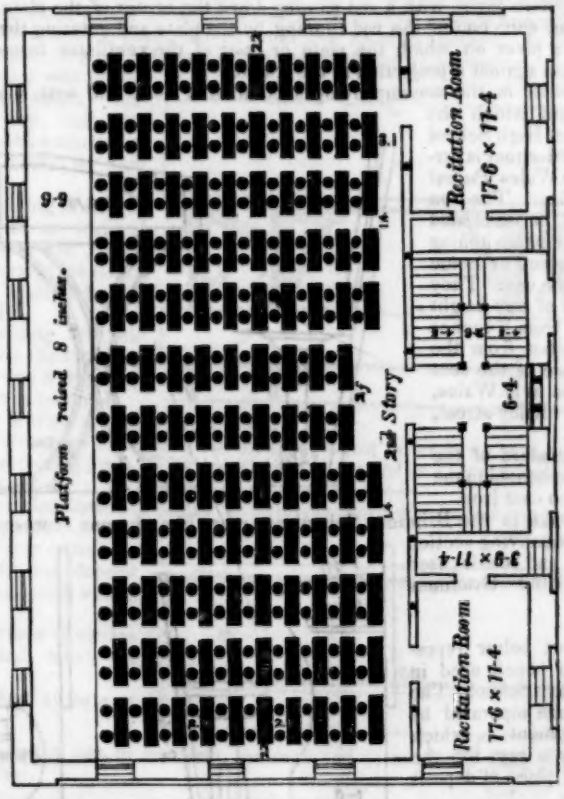
S, S—Stairways, leading from entry to Normal School-room. N, S, R—Normal School-room, 38 feet by 37. e, e—Single seats. d, d—Double desks. P, P—Platform, with recesses in the partition behind for a library. c, c—Closets for apparatus. R, R—Recitation-rooms, one 22 feet by 11, the other 22 feet by 10½.

PLANS, &c., OF BRIMMER GRAMMAR SCHOOL, BOSTON.

This building was erected in 1843. It is situated on Common-street, near Washington. It is 74 feet in length on the street, by 52 feet deep, with three stories. The entrance is in the center of the front into a hall 8 feet wide, leading through into the yard in the rear, which is divided by a wall into three portions. The passage to the second and third floors is by a double flight of stairs near the front door.

The first floor is occupied by two Primary School-rooms, each 30 by 22 feet, and 11 feet high; and the Ward-room, 30 by 50 feet.

The school-room on the *second floor* is 70 feet by 37 feet wide, and 14 feet 6 inches high between the bays. The ceiling is plastered up between the bays, (cross timbers) by which eighteen inches are grained in height, dividing the ceiling into equal compartments. There are two recitation rooms, one



on each side the entrance, 17 feet 6 inches, by 11 feet 4 inches each, with two windows in each room, and benches on all the sides for the pupils. The school-room is lighted on three sides, and contains 118 desks, and 236 chairs, two chairs to each desk, the desks and chairs being of four sizes. The tops of the desks are cherry wood, and the chairs are Wales' patent. The desks are separated by aisles one foot four inches in width, except the center aisle, which is two feet wide.

The aisles on the side nearest the recitation-rooms, are three feet wide, and those at each end, 2 feet 6 inches each. The platform on which are the desks of the master and assistants, is eight inches high, and 6 feet 6

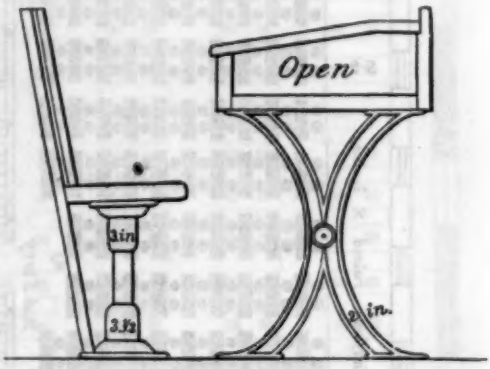
inches wide, and the desks are so placed *that the pupils sit with their backs to the platform;* and the pupils are so arranged at the desks in classes and sections, that when one class is reciting, the desk is only occupied by one pupil. The windows are shaded by inside blinds painted green.

The school-room on the *third floor* is of the same size, having an arched ceiling 13 feet high in the center, with recitation-rooms and other arrangements similar to the school-room on the second floor.

The building is warmed by two furnaces, and ventilated by six flues, discharging into the attic, from which the impure air is carried off by copper ventilators in the roof. The openings into the flues in the school-rooms are controlled by Preston's ventilators.

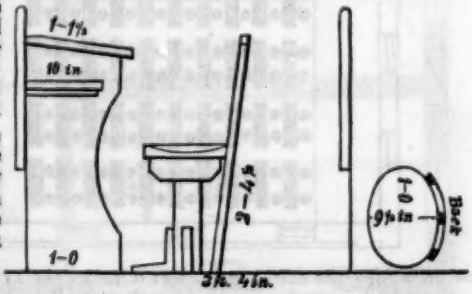
The frame of Preston's Ventilator is made of a flat bar of iron $2\frac{1}{2}$ by $\frac{1}{4}$ inch, framed at the corners, the end at each corner running by in order to receive a clamp to screw the frame to the brick work; the door is of plate iron, ($\frac{1}{16}$ wire gage), with a rod passing down the center of the plate, on the back side, each end of the rod running by the plate and entering the frame, forming a pivot on which the plate or door of the ventilator turns. The door shuts against a projection in the frame.

The chair in the accompanying section of a desk and seat, similar to those with which the new Latin High School in Bedford-street is furnished, is Wales' *Patent School chair*. The iron standard is one solid piece, having no joining to get loose, or come apart in the use. They are made of any height and size from 8 inches to 17 inches from the top surface of the seat to the floor, by S. Wales, jun., 66 Kilby-street, Boston.

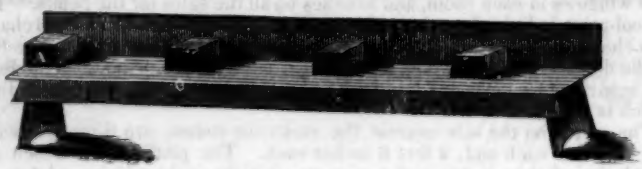


The standard of the desk, represented in the cut, is also cast iron.

The desks in the Brimmer School are more like the one represented in the accompanying section of desk and chair used in the Eliot Grammer School.



The cut below represents the bench used in the Primary School. The scholars are separated by a compartment A, which serves as a rest for the arm, and place of deposit for books.

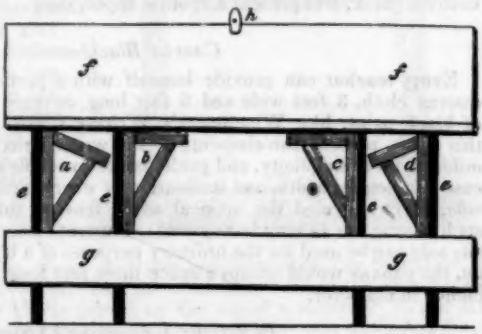


Hints respecting Blackboards.

The upper portion of the standing blackboard should be inclined back a little from the perpendicular, and along the lower edge there should be a projection or trough to catch the particles detached from the chalk or crayon when in use, and a drawer to receive the sponge, cloth, lamb's-skin, or other soft article used in cleaning the surface of the board.

Blackboards, even when made with great care, and of the best seasoned materials, are liable to injury and defacement from warping, opening of seams, or splitting when exposed to the overheated atmosphere of school-rooms, unless they are set in a frame like a slate, or the panel of a door.

By the following ingenious, and cheap contrivance, a few feet of board can be converted into a table, a sloping desk, one or two blackboards, and a form or seat, and the whole folded up so as not to occupy a space more than five inches wide, and be easily moved from one room to another. It is equally well adapted to a school-room, class-room, library or nursery.



f f Under side of the swinging board, suspended by rule-joint hinges, when turned up, painted black or dark chocolate.

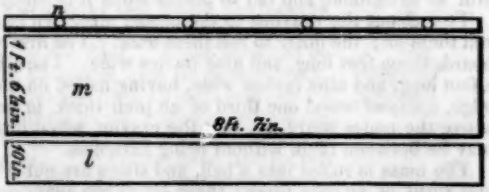
a d Folding brackets, inclined at an angle of 75 degrees, and swung out to support the board when a sloping desk is required.

b c Folding brackets to support the swinging board when a bench or flat table is required.

e e e e Uprights attached to the wall.

g g Form to be used when the swinging board is let down, and to be supported by folding legs. The under side can be used as a blackboard for small children.

h A wooden button to retain the swinging board when turned up for use as a blackboard.



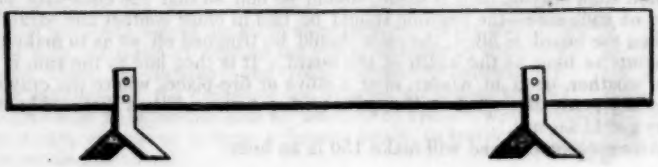
n Opening to receive inkstands, and deposit for slate, pencil, chalk, &c.

m Surface of swinging board when let down.

l Surface of form or bench.

When not in use, or let down, the desk and form should hang flush with each other.

A cheap movable blackboard can be made after the following cut (Fig. 3.



Slate Blackboard.

In the class-rooms of the American Asylum for the Deaf and Dumb, and all similar institutions, where most of the instruction is given by writing, and drawings on the blackboard, large slates from three feet wide, to four feet long are substituted for the blackboard. These slates cost from $2 to $3, and are superior to any other form of blackboard, and in a series of years prove more economical.

Plaster Blackboard.

As a substitute for the painted board, it is common to paint black a portion of the plastered wall when covered with hard finish, (i. e. plaster of Paris and sand;) or to color it by mixing with the hard finish a sufficient quantity of lamp-black, wet with alcohol, at the time of putting it on. The hard finish, colored in this way, can be put on to an old, as well as to a new surface. Unless the lamp-black is wet with alcohol, or sour beer, it will not mix uniformly with the hard finish, and when dry, the surface, instead of being a uniform black, will present a spotted appearance.

Canvas Blackboard.

Every teacher can provide himself with a portable blackboard made of canvas cloth, 3 feet wide and 6 feet long, covered with three or four coats of black paint, like Winchester's Writing Charts. One side might, like this chart, present the elements of the written characters classified in the order of their simplicity, and guide-marks to enable a child to determine with ease the height, width, and inclination of every letter. Below, on the same side, might be ruled the musical scale, leaving sufficient space to receive such characters as may be required to illustrate lessons in music. The opposite side can be used for the ordinary purposes of a blackboard. When rolled up, the canvas would occupy a space three feet long, and not more than three inches in diameter.

Directions for making Crayons.

A school, or the schools of a town, may be supplied with crayons very cheaply, made after the following directions given by Professor Turner of the American Asylum for the Deaf and Dumb.

Take 5 pounds of Paris White, 1 pound of Wheat Flour, wet with water, and knead it well, make it so stiff that it will not stick to the table, but not so stiff as to crumble and fall to pieces when it is rolled under the hand.

To *roll* out the crayons to the proper size, two boards are needed, *one*, to roll them *on*; the *other* to roll them *with*. The first should be a smooth pine board, three feet long, and nine inches wide. The other should also be pine, a foot long, and nine inches wide, having nailed on the under side, near each edge, a slip of wood one third of an inch thick, in order to raise it so much above the under board, as, that the crayon, when brought to its proper size, may lie between them without being flattened.

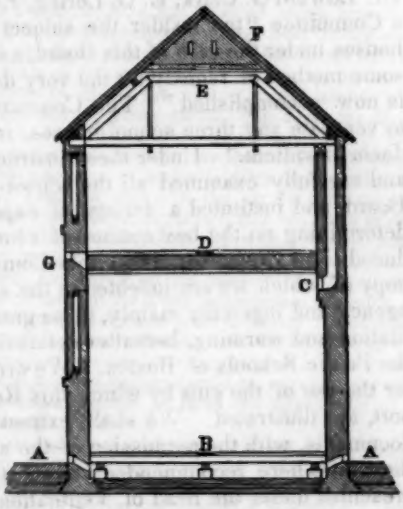
The mass is rolled into a ball, and slices are cut from one side of it about one third of an inch thick; these slices are again cut into strips about four inches long and one third of an inch wide, and rolled separately between these boards until smooth and round.

Near at hand, should be another board 3 feet long and 4 inches wide, across which each crayon, as it is made, should be laid so that the ends may project on each side—the crayons should be laid in close contact and straight. When the board is filled, the ends should be trimmed off so as to make the crayons as long as the width of the board. It is then laid in the sun, if in hot weather, or if in winter, near a stove or fire-place, where the crayons may dry gradually, which will require twelve hours. When thoroughly dry, they are fit for use.

An experienced hand will make 150 in an hour.

Hints respecting Ventilation.

The annexed section exhibits the mode recommended in the "Minutes of the Committee of Council (England) on Education," for regulating a supply of fresh air, and providing for the escape of that rendered unfit for respiration in school-houses with two stories. A, A and G are gratings communicating by a passage through the external wall into a space under the floor, by which cold pure air enters at B and D through valvular openings in the floors into each apartment respectively. The extent of these openings can be enlarged or diminished or entirely closed at any time by turning the valve or register with which each opening should be furnished. At C and E the impure air can be allowed to escape through valvular openings in or near the ceiling; from the lower apartment, by means of a flue in or along the wall into the open space between the upper ceiling and roof; and from the upper apartment directly into the same space. At F are air grates in the ends of the building through which the warm impure air escapes.



The mode of ventilation, above described and illustrated, can be improved by introducing the pure cold air from the atmosphere above the building by one of *Mott's Receiving Cowls* placed on the top of a recess of four or six inches made in the wall if built of brick, or of a flue or pipe extending from the floor to the roof, and discharging it into the room by a valvular opening in the floor. The escape of impure air can be hastened by placing one or more of *Mott's Exhausting Cowls* on a ventilating flue or flues, leading directly from each apartment above the roof or from the attic, into which the impure air has been discharged. The flues or recess, both for introducing pure air, and discharging that which has become impure should have two openings into the room, one near the ceiling and the other at the floor. These flues can be constructed without any additional cost for mason work, by leaving a recess of 4 inches (in a 12 inch wall) by 20 inches, and continuing it through the coping on which the cowl is placed. The furring for the lath being 1 inch, leaves a flue of 100 square inches. The beams, floor, and ceiling will complete the flue. If the room is warmed by one or more stoves, the cold air should be introduced within a few inches of the bottom of the stove. The openings into the flues should be furnished with valves or doors, and should be managed so as to admit the pure cold air to the most heated part of the room, and effect the escape from that part of the room where the air is most impure. This will vary with the mode of heating the room, whether by fireplace, stove, or furnace; and from summer to winter. The openings for the escape of the vitiated air should be so placed as to cause the pure air warmed by contact with the stove, or flowing in from a furnace below, to traverse the whole apartment.

Receiving Cowl.

Exhausting Cowl.

Methods of Ventilation and Warming, recently introduced into the School-Houses of Boston.

In February, 1846, the School Committee of Boston appointed Dr. Edward G. Clark, E. G. Loring, Esq., and Rev. Charles Brooks, a Committee "to consider the subject of ventilation of the school-houses under the care of this Board, and to report at a future meeting some method of remedying the very defective manner in which it is now accomplished." The Committee were further "authorized to ventilate any three school-houses, in such manner as they may deem expedient." Under these instructions, the Committee visited, and carefully examined all the school-houses under the care of the Board, and instituted a variety of experiments, for the purpose of determining on the best method of ventilation, to be generally introduced. In December, 1846, this Committee made a Report, for a copy of which we are indebted to the author, Dr. Clark, by whose agency and ingenuity mainly, these great improvements, both in ventilation and warming, hereafter detailed, have been introduced into the Public Schools of Boston. We are also indebted to Dr. Clark for the use of the cuts by which this Report, and a subsequent Report, are illustrated. We shall extract largely from these valuable documents, with the permission of the author. It will be seen that the views here recommended are substantially the same with those presented under the head of Ventilation, in this Treatise.

"Your Committee desire to call the attention of this Board, chiefly to the consideration of such general and well established Physiological and Philosophical principles, as have a distinct and intimate relation to the subject of this Report, and may be useful in its elucidation.

In doing this, there are two things of which they hope to satisfy the Board.

First. The necessity of a system of ventilation, which shall furnish, for all the pupils in the Public Schools of Boston, at all times, an abundant supply of an atmosphere entirely adapted, in its purity and temperature, to the purposes of respiration.

Secondly. The entire failure of the measures heretofore adopted to accomplish this desirable end.

The function of Respiration, is that process, by whose agency and constant operation, atmospheric air is admitted to the internal surface of the lungs, and there brought into close contact with the blood, for the purpose of effecting certain changes in it, which are essential to the continuance of life, and to maintain the integrity of the bodily organs. During this process, the atmosphere is constantly losing its oxygen, which is carried into the circulation, while, at the same time, it is becoming overcharged with the carbonic acid gas, which is continually thrown off from the lungs by respiration. This effete and deadly poison spreads itself rapidly into all parts of the room.

'M. Lassaigne has shown, by a series of investigations, that, contrary to a common opinion, the air in a room which has served for respiration without being renewed, contains carbonic acid alike in every part, above as well as below; the difference in proportion is but slight; and, where appreciable, there is some reason to believe that the carbonic acid is in greater quantity in the upper parts of a room. These experiments establish the very important fact, that all the air of a room must be changed, in order to restore its purity.'*

Dr. Wyman makes the following remarks on this point: 'Although carbonic acid is a much heavier gas than atmospheric air, it does not, from this cause, fall to the floor, but is equally diffused through the room. If the gas is formed on the floor without change of temperature, this diffusion may not take place

*Silliman's Journal for September, 1846.

rapidly. In the celebrated *Grotto del Cane*, carbonic acid escapes from the floor, and rises to a certain height, which is pretty well defined to the sight on the walls; below this line, a dog is destroyed, as if in water; above it, he is not affected. An analysis of the air above and below a brazier has been made, and it was found equally contaminated,—the former containing 4.65 per cent., and the latter 4.5 per cent. of carbonic acid.

'From the experiments of M. Devergie, who has devoted much attention to the poisonous effects of these gasses, it appears, that the heat disengaged from the combustion of charcoal, produces an equable mixture at all elevations in the apartment; and this state of things continues *as long as the room remains warm*; but after twelve hours or more, the carbonic acid sinks, and while that near the ceiling contains only a seventy-eighth, that near the floor contains nearly four times as much, or a nineteenth.' (*See Prac. Trea.* p. 77.)

If further proof be needed, to establish this position, we have other testimony. During respiration, a considerable quantity of vapor is discharged from the lungs. With regard to this, Mr. Tredgold says: 'if the air did not contain this mixture of vapor, it would not rise when expelled; and we have to admire one of those simple and beautiful arrangements, by which our all-wise Creator has provided against the repeated inhalation of the same air; for a mixture of azote, carbonic acid gas, and vapor, at the temperature it is ejected, is much lighter than common air even at the same temperature. Hence, it rises with such velocity, that it is entirely removed from us before it becomes diffused in the atmosphere. But as all gaseous bodies and vapors intimately mix when suffered to remain in contact, we see how important it is that ventilation should be continual; that the noxious gasses should be expelled as soon as generated; and that the ventilation should be from the upper part of a room.' (*See Tredgold on Warming, &c.*, p. 70.

If, to the foul effluvia ejected from the lungs, and accumulating in an apartment as badly ventilated as one of our school-rooms, be added the fouler matter thrown into the air from the insensible perspiration of so many individuals, many of whom are of uncleanly habits in person and apparel, it is apparent, that, in a very limited period of time, the air, in a perfectly close room, would become so entirely unfit for respiration, that, to all who were exposed to its influence, submersion in water could not be more certainly fatal.

The terrible effects of continued exposure to carbonic acid gas in a concentrated form, have been graphically described by Howard, in his account of the Black Hole of Calcutta. Of one hundred and forty-six persons, shut up in this place for only ten hours, without any other means of ventilation than one small opening, but twenty-six were found alive, when it came to be opened; and most of these suffered afterward from malignant fevers.

The fainting of feeble persons in crowded assemblies, and the asphyxia, so often produced in those who descend into deep wells without suitable precaution, are familiar examples of the same noxious effects of this poison.

In has been usually estimated, that every individual, by respiration, and the various exhalations from the body, consumes or renders unfit for use, at least from four to five cubic feet of air per minute. This is probably a low estimate; but authors of good repute differ considerably on this point. Mr. Tredgold's remarks, in this connection, are interesting and pertinent. 'The Physiological Chemists,' says he, 'have placed in our hands a more accurate means of measuring the deterioration of air in dwelling rooms, than by the best eudiometer; for they have shown, by repeated experiments on respiration, that a man consumes about thirty-two cubic inches of oxygen in a minute, which is replaced by an equal bulk of carbonic acid from the lungs. Now, the quantity of oxygen in atmospheric air is about one fifth; hence it will be found, that the quantity rendered unfit for supporting either combustion or animal life, by one man, in one minute, is nearly one hundred and sixty cubic inches, by respiration only. But a man makes twenty respirations in a minute, and draws in and expels forty inches of air at each respiration; consequently, the total quantity contaminated in one minute, by passing through the lungs, is eight hundred cubic inches.'* The other sources of impurity, which should be considered, will increase the estimate to the amount above stated. The amount of vapor discharged from the lungs, and thus added to the impurities of the air, is said to exceed six grains per minute. It has also been shown

*Tredgold on Warming, &c., p. 69.

that air, which has been some time in contact with the skin, becomes almost entirely converted into carbonic acid.

In estimating the amount of fresh air to be supplied, we ought not merely to look at what the system will tolerate, but that amount which will sustain the highest state of health for the longest time. Dr. Reid recommends at least ten cubic feet per minute, as a suitable average supply for each individual; and states that his estimate is the result of an 'extreme variety of experiments, made on hundreds of different constitutions, supplied one by one with given amounts of air, and also in numerous assemblies and meetings, where there were means for estimating the quantity of air with which they were provided.' (*Illustrations of Ventilation*, p. 176.)

These calculations refer to adults; but the greater delicacy of the organization of children, and their feebler ability to resist the action of deleterious agents, together with their greater rapidity of respiration, demand for them at least an equal supply. Proceeding upon this basis, and multiplying the amount required per minute, by the minutes of a school session of three hours, we have eighteen hundred cubic feet for each pupil, and for two hundred and fifty pupils—the average maximum attendance in one of our large school-rooms,—450,000 cubic feet, as the requisite quantity for each half-day. The rooms contain about 22,500 cubic feet only: so that a volume of air, equal to the whole cubic contents of each room, should be supplied and removed, in some way, ten times every three hours, in order to sustain the atmosphere in them at a point which is perfectly wholesome and salubrious. For such a purpose, the present means are so entirely inadequate, that it was found that the air of a room became tainted in ten or fifteen minutes. In ordinary cases, four per cent. of the air expelled from the lungs is carbonic acid. The presence of five or six per cent. will extinguish a lamp, and with difficulty support life. It is therefore certain, that the air would become deprived of all its best properties in one school session.

Le Blanc,—who examined many public and private buildings, in France and elsewhere,—speaking of the Chamber of Deputies, where sixty-four cubic feet of fresh air *per minute*, were allowed to each individual, states, that of 10,000 parts escaping by the ventilator, twenty-five were carbonic acid; while the quantity of this gas ordinarily present in the atmosphere, is but $\frac{4}{10000}$. Dr. Reid states, that he never gave less than thirty cubic feet of air a minute, to each member of the House of Commons, when the room was crowded; and once he introduced, for weeks successively, sixty cubic feet a minute, to each member.

The very earliest impressions received by your Committee, in their visits to the school-houses, satisfied them of their lamentable condition in regard to ventilation. In some of them, they found the air so bad, that it could be perceived before reaching the school-rooms, and in the open entries; and the children, as they passed up and down the stairs, had their clothes and hair perceptibly impregnated with the fœtid poison. And these circumstances existed in houses, where the open windows testified, upon our entrance, that the Masters had endeavored to improve the atmosphere by all the means placed at their disposal. To this custom,—*that of opening windows in school hours*,—the Instructors are compelled to resort, for relief; and this expedient, certainly, is the lesser of two very great evils. Your Committee found in their visits to the school-houses, during the severest days of last winter, that no school-room had less than three, and that more than half of them had at least seven windows open for the admission of pure air. Yet this dangerous and injurious practice only mitigates the evils of bad air, by creating others. It produces colds and inflammatory complaints, and the air still remains impure, offensive, and highly deleterious; sufficiently so, to affect the delicate organization of childhood, to blight its elasticity, and destroy that healthful physical action, on which depends the vigor of maturer years.

We have already referred to some of the more violent and sudden effects of exposure to air highly charged with these noxious gasses. There are others, which are more remote, and, to a superficial observer, less noticeable. But they are not, therefore, of less importance. The grave consequences of a long-continued exposure to an atmosphere but a little below the standard of natural purity, although not immediately incompatible with life, can hardly be over-

stated. These effects are often so insidious in their approach, as hardly to attract notice; they are therefore the more necessary to be provided against in advance.

Children, confined in the atmosphere of these schools, soon lose the ruddy and cheerful complexions of perfect health which belong to youth, and acquire the sallow and depressed countenances which might reasonably be expected in over-worked factory operatives, or the tenants of apartments unvisited by the sun or air. We noticed in many faces, also, particularly towards the close of a school session, a feverish flush, so bright that it might easily deceive an inexperienced eye, and be mistaken for a healthy bloom. Alas! it was only a transient and ineffectual effort of nature to produce, by *overaction*, those salutary changes which she really wanted the *power* to accomplish.

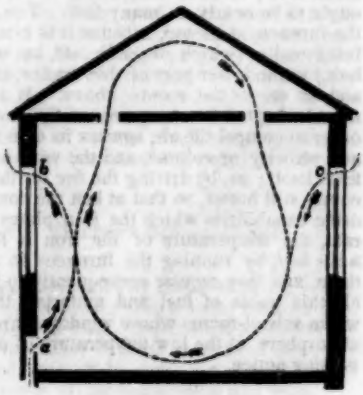
The condition of the pupils, depressed as they are by these influences, is constantly demanding increased exertions from their Instructors, while the requirements of the age place the standard of education at an elevation sufficiently difficult of access under the most favorable circumstances.

Your committee are satisfied, therefore, that the present state of the school-houses daily impairs the health of the pupils and Instructors, and the efficiency of the schools for the purposes of instruction. That its continuance will produce, not only immediate discomfort and disease, but, by its effect on the constitutions of the children, who must pass in them a large portion of those years most susceptible to physical injury, will directly and certainly reduce the amount of constitutional vigor hereafter to be possessed by that large mass of our population, which now and hereafter is to receive its education in these schools.

Although the atmosphere in the different school-houses varied very much in particular cases, either owing to the time of the visits, or from the amount of attention and intelligence of the Masters, yet in none of them was it at all satisfactory; not one of them was furnished with any useful or systematic means of ventilation. Every one, in order to be kept in a tolerably comfortable condition in this respect, required the frequent and laborious attention of the Instructors, and often to a degree which must have seriously interfered with their legitimate duties.

All of the rooms are provided with registers, in or near the ceiling, ostensibly for the purpose of discharging the foul air, but which your Committee believe to be almost entirely useless. The openings through the roof into the open air, where they exist, are so small, as to be quite inadequate to relieve the attics; so that the bad air must accumulate there, and, after becoming condensed be gradually forced back again, to be breathed over by the same lungs which have already rejected it. The condition of the apartments, after undergoing a repetition of such a process, for any length of time, can easily be imagined."

A reference to the subjoined diagram will explain at once the present state of the Ventilation of the School-Houses.



a. Heated air from furnace.
b. Hot air escaping through open window.
c. Cold air entering through open window.

It may be a matter of surprise, to some, perhaps, that the subject of ventilating our school-rooms has not long ago received the consideration necessary to remedy, or even to have prevented altogether, the evils of which we at present complain. But these evils have not always existed. It should be recollected, that the stoves and furnaces now in common use, are of comparatively modern date; and moreover, that the ample fireplaces, which they have displaced, always proved perfectly efficient ventilators, although, it is true, somewhat at the expense of comfort and fuel. But in closing the fireplaces, and substituting more economical methods of warming, evils of far greater magnitude have been entailed upon us.

It is evident, that, in order to carry into operation any complete system of ventilation, there must be connected with it some apparatus to regulate the temperature of the air to be admitted, as well as to ensure its ample supply. Your committee have accordingly examined, with much care, this part of the subject. A majority of the buildings are furnished with 'hot-air furnaces,' situated in the cellars; the remainder with stoves, placed in the school-rooms themselves. Most of the furnaces possess great heating powers,—indeed much greater than is necessary, if the heat generated by them were properly economized, or could be made available;—but, as now constructed, they are almost worse than useless, consuming large quantities of fuel, and, at the same time, so overheating the air which passes through them, as to deprive it of some of its best qualities, and render it unsuitable for respiration. It is difficult to define, with precision, and by analysis, the changes which take place in air subjected to the action of metallic surfaces, at a high temperature. The unpleasant dryness of the air can be detected, very readily, by the senses; and the headache, and other unpleasant sensations, experienced by those who breathe such an atmosphere, would seem to prove a deficiency of oxygen and electricity. The rapid oxydation and destruction of the ironwork of the furnaces themselves, also tends to confirm this supposition.

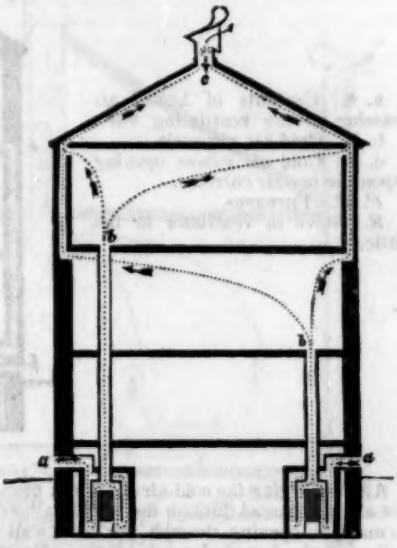
It has been ascertained, by repeated examinations, that the temperature of the air, when it arrives at the rooms, is often as high as 500° and 600° Fahrenheit. Of course, it is entirely impossible to diffuse air, thus heated, in the parts of the room occupied by the pupils. Much of it passes rapidly out of the windows, which may be open; the rest to the ceiling, where it remains until partially cooled, gradually finding its way down by the walls and closed windows, to the lower parts of the room. The consequences are, that, while much more caloric is sent into the apartment than is requisite, many of the pupils are compelled to remain in an atmosphere which is at once cold and stagnant.

The source of the cold air for supplying the furnaces, is not always free from objection; some being drawn from the neighborhood of drains, cesspools, &c. This is a radical defect, as it must inevitably affect the whole air of the building. The boxes, which admit the cold air to the furnaces, are much too contracted; some of them being only a few inches square, when their capacity ought to be nearly as many feet. The air enters the 'cold-air' chamber of the furnace, at its top, whence it is intended to be carried down between thin brick walls, (which *should be cold*, but which are often heated to 300° Fahrenheit,) to the lower part of the furnace, and thence into the 'hot-air' chambers, and so on to the rooms above. It is obvious that the 'hot-air' chamber must be heated to a temperature far beyond that of the 'cold-air' chamber, in order to compel the air, against its own natural tendencies, to pass into it with any velocity or volume, and the very attempt to accomplish this, almost defeats itself; as, by driving the fire for this purpose, the 'cold-air' chamber becomes still hotter, so that at last the contest is decided only by the greater calorific capabilities which the iron plates possess over the brick wall. At any rate, the temperature of the iron is frequently raised to a *red* and even a *white heat*, by running the furnaces in the ordinary way. This soon destroys them, and they require consequently to be frequently renewed. In addition to all this waste of fuel and material, the folly of attempting, in any way, to warm school-rooms whose windows are freely opened to the admission of an atmosphere, at the low temperature of our winter climate, may well claim a passing notice.

The following diagrams will exhibit the mode in which the two houses already referred to, are now ventilated.

PLAN OF THE VENTILATION OF THE ELIOT SCHOOL-HOUSE.

a. a. Cold air channels to furnaces.
b. b. Heated air.
The arrows show the currents of air from the furnaces to the outlet at the roof.
c. Gas burner.

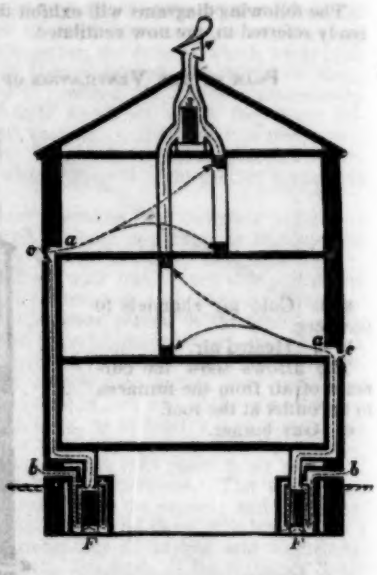


This house was entirely without any external opening through the roof. The other arrangements in it presented nothing peculiar. The 'exits and the entrances' were all as deficient in capacity as usual. The first care was to perforate the roof. This was accordingly done, and an opening of sufficient size made to carry a turn-cap of two and a half feet in diameter in its smallest part. The cold-air shaft, with an area of only one hundred and forty square inches, was enlarged so as to measure six hundred, or about four times its former size. The necessary repairing of one furnace, gave us an opportunity to enlarge its air-chamber very considerably. Water, for evaporation, was placed within a chamber of the furnace. The registers in the rooms opening into the attic, being below the ceiling, were raised to the highest point, and increased in size.

Although we think the want of connection of the cowl at the roof with the registers from the rooms by closed tubes, a decided disadvantage, we were satisfied, on the whole, with the results; as the alterations gave great relief. These changes were made during the month of February, 1846, and the only inconvenience suffered during the winter, was the occasional rise of the temperature to five or ten degrees beyond the desired point. The atmosphere has lost its bad odor almost entirely, and is of course much more agreeable. A gas burner has lately been placed in the throat of the ventilator, for use when extra power is needed.

PLAN OF THE VENTILATION OF THE ENDICOTT SCHOOL-HOUSE.

This house, as well as the preceding, was heated by furnaces in the cellar, one for each room. Its ventilating flues were arranged in a better manner than usual, opening into little separate chimneys which pierced the roof near the copings. But they had proved to be insufficient, both on account of their size and situation. They were also affected sensibly by down-gusts, which completely reversed their action in certain states of the atmosphere and wind.



a. a. Currents of heated air passing to the ventilating flues.
b. b. Cold air channels.
c. c. Cold air valves opening upon the hot-air currents.
F. F. Furnaces.
S. Stove in ventilator in the attic.

After enlarging the cold-air shaft to a proper size, it was thought best, (as the hot-air pipe passed through the brick wall, so that it could not easily be altered,) to make an opening through the outer wall directly behind the register which delivered the hot-air into the room. An aperture of sixteen inches square, commanded by a revolving damper, was therefore cut. It has been found to answer exceedingly well; as we now get a much larger volume, of more temperate and purer air.

For the delivery of the bad air, the following arrangements were adopted. Large wooden boxes, or air-shafts, were carried from the floor of each story into the attic, where they communicate, by closed metal pipes of the same size, with a tin cylinder, three feet in diameter, which is continued to the roof, terminating there in a large cowl. There are openings, at the top and bottom of each room, into the ventilating shafts, which can be used separately, or together, as the state of the atmosphere requires.

An air-tight coal stove, placed within the drum, in the attic, completes the apparatus. This has been only recently constructed; but from results already produced, there is no doubt of its entire ability to accomplish all that is desirable.

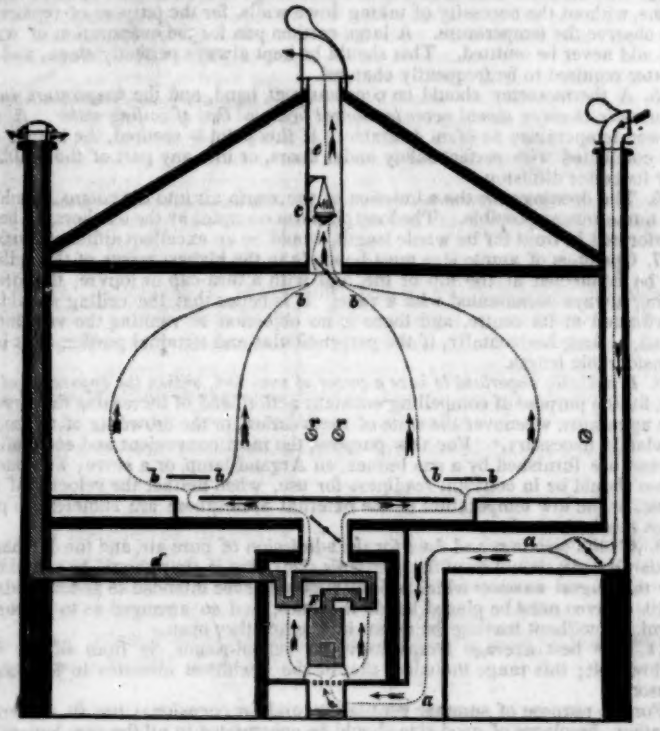
The same general statements which have been made with regard to the Grammar School-houses, will apply to the Primary School-houses. They are undoubtedly in as bad a condition, to say the least; and from their smaller capacities in proportion to the number of pupils which they contain, require particular attention.

For ventilation of these, and the Recitation rooms, which resemble them in structure and size, your Committee recommend the use of the double fireplace* or the Ventilating Stove, which will be hereafter described. If the latter be used, ventilating flues, opening at the ceiling, must be carried out of the roof.

It only remains for your Committee to describe, more particularly, the system of ventilation which they consider to be, in its general features, best adapted for the school-houses under the care of the Board. Much of it has already been anticipated in other parts of this Report; and the following plan will show, at a glance, better than any description can do, its particular features.

* See page 38 of this Essay for a diagram and description.

DIAGRAM SHOWING THE BEST GENERAL PLAN FOR WARMING AND VENTILATING THE GRAMMAR SCHOOL-HOUSES.



a. a. Cold-air channel, three feet in diameter, opening underneath the Furnace.

F. Furnace, three feet in diameter in a brick chamber ten feet square. The walls twelve inches thick.

d. Smoke flue, surmounted with Mr. Tredgold's chimney top.

b. b. b. b. Currents of warmed air, passing from the furnace, through a main flue of four feet in diameter, which supplies two branch flues. From these the air is diffused into all parts of the room, by means of the tablets which are placed over the mouths of the registers.

e. The ventilating shaft, two and a half feet in diameter, into which the foul gasses are collected, and from which they are finally discharged into the open air.

c. An Argand Lamp, to be lighted from the attic.

r. r. r. Registers, by means of which the whole circulation is controlled.

The Committee recommend attention to the following *general rules for Ventilation and Warming.*

1. The air must be taken from a pure source. The higher parts of the building are the best, as thereby all impurities, which often contaminate air taken from near the surface of the ground, are avoided.

2. In order to ensure a constant and abundant supply, the air shaft must be surmounted with a cowl or hood of some kind, with its mouth turned *towards the wind.*

3. The fresh air should in all cases be carried entirely beneath the furnace.

If the cellar is wet and the situation low, the underground culvert or channel should be of brick, laid in cement.

4. The furnace chamber should be so large that it can be entered at any time, without the necessity of taking down walls, for the purpose of repairs, or to observe the temperature. A large earthen pan for the evaporation of water should never be omitted. This should be kept always perfectly clean, and the water required to be frequently changed.

5. A thermometer should be constantly at hand, and the *temperature in the warm-air chamber should never be allowed to exceed that of boiling water.* A still lower temperature is often desirable. If this point is secured, the hot air can be conducted with perfect safety under floors, or into any part of the building, for its better diffusion.

6. The openings for the admission of the warm air into the rooms, should be as numerous as possible. The long platform occupied by the teachers, by being perforated in front for its whole length, would be an excellent diffusing surface.

7. Openings of ample size must be made in the highest points of the ceiling, to be connected at the top of the roof with a turn-cap or louvre, the former being always surmounted with a vane. It is better that the ceiling should be perforated at its centre, and there is no objection to running the ventilating shaft, at first, horizontally, if the perpendicular and terminal portion of it is of considerable length.

8. *It is highly important to have a power of some sort, within the apparatus at its top*, for the purpose of compelling constant action, and of increasing the force of the apparatus, whenever the state of the weather, or the crowding of the room, render it necessary.* For this purpose, the most convenient and economical means are furnished by a gas burner, an Argand lamp, or a stove; and one of these should be in constant readiness for use, when neither the velocity of the wind, or the low temperature of the external aimosphere are sufficient to produce the desired effect.

9. All the openings and flues for the admission of pure air, and the discharge of the foul air, should be of the *maximum* size; that is, they should be calculated for the *largest numbers* which the apartment is ever intended to accommodate.

10. Valves must be placed in all the flues, and so arranged as to be easily regulated without leaving the rooms into which they open.

11. The best average temperature for school-rooms, is from 64° to 68° Fahrenheit; this range including that of the healthiest climates in their best seasons.

For the purpose of summer ventilation, and for occasional use in moderate weather, fireplaces of good size should be constructed in all the new houses, at least. They should always be double, and furnished with large air chambers, which communicate with the open air. When not in use, they must be closed with tight boards or shutters, as they would otherwise interfere with the regular ventilation.

With these arrangements, intelligently controlled by the Teachers, your Committee believe that an atmosphere will be secured which will be perfectly agreeable and salubrious; which will lighten the labors of the Teachers, and promote the comfort, health, and happiness, of the thousands of children who are daily congregated in our Public Schools."

This Report was received, and the same Committee were "directed to adapt to each school-room such apparatus, if any, as may be required to secure to them proper ventilation in winter and summer, and to make such alterations and arrangements of the furnaces as may be required." To be able to execute this order, the Committee applied to the City Authorities for an appropriation of $4,000, which was readily granted, after an examination by a Joint Committee of the Board of Aldermen and Common Council, of the school-houses in which the improved ventilating apparatus had been introduced. The following is an extract from the Report of the Joint Committee:

* This in practice has not been found *necessary*, although it may be sometimes.

"In order to be fully satisfied, the Committee visited the Endicott School, where the apparatus was in operation. The day was exceedingly wet and disagreeable, and yet the air of the rooms was found in an unobjectionable condition. The masters fully sustained the representations of the petitioners; and from their statements, as well as from their own observations, the Committee were satisfied of the beneficial effects of said apparatus.

In order, however, to have a more full investigation of the matter, the Committee, on a subsequent day, visited the Johnson School and the Boylston School. The day was dry and cold, and they found the air in the Johnson School in a tolerably good condition. This is a girls' school; and it is well known that the pupils in such schools are neater, and attend in cleaner and more tidy apparel, than the pupils in the boys' schools.

In the Boylston School, however, the Committee found the air very disagreeable and oppressive; and they could not but feel the importance of executing some plan of relief."

If the Committee of Ways and Means,—or whatever the money-compelling power may be called—in every city, and town, and district, would satisfy themselves by actual examination, of the necessity of a more perfect system of ventilation in all school-rooms, or in all public halls where a large number of human beings are congregated for a considerable length of time, and where fires or lamps are burning, a reform would be speedily introduced in this respect.

With the means thus placed at their disposal, the Committee applied themselves diligently to the duty of ventilating the school-houses—and at the close of the year, they had the satisfaction of announcing in their Final Report, "that the Grammar School-houses of Boston are now in a better condition in respect to their ventilation, than any other Public Schools in the world." The Committee thus sum up the results of their labors.

"The diversity of arrangement and the modifications in our plans which we have been compelled by circumstances to adopt, have had their advantages, and enabled us to arrive at the best results, and to satisfy ourselves entirely in regard to the particular *set of apparatus* which we can recommend with confidence for future use as decidedly the most effective and convenient. We have therefore furnished drawings and specifications of the set of apparatus which we recommend.

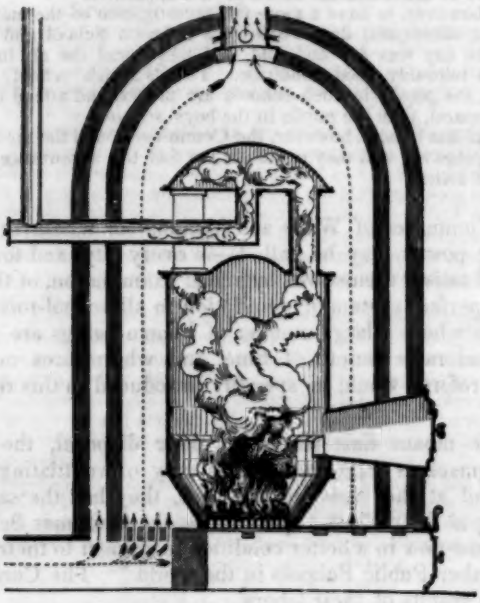
Chilson's Furnace.

Your Committee have made themselves acquainted not only with all the Furnaces which have been manufactured in this place, and its neighborhood, but with all those which have been exhibited here recently. Most of them show much ingenuity of contrivance and excellence of workmanship; but are all, so far as we can judge, inferior in many respects, to the one invented by Mr. Chilson, a model and plans of which we now exhibit, and recommend as superior to all others.

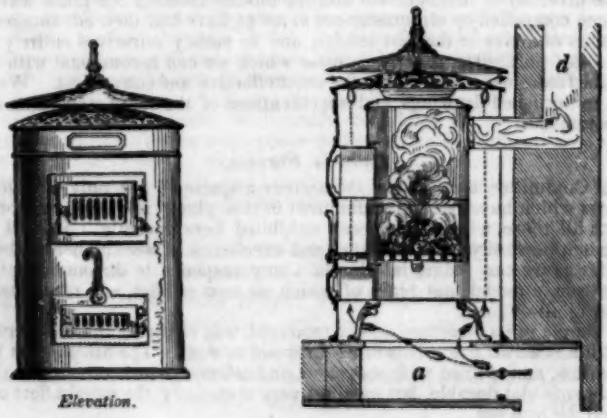
It is simple in its structure, easily managed, will consume the fuel perfectly, and with a *moderate* fire. It is fitted for wood or coal. The fire place is broad and shallow, and is lined with soapstone or fire-brick, which not only makes it perfectly safe and durable, but modifies very materially the usual effect of the fire upon the iron pot.

The principal radiating surfaces are wrought iron, of a suitable thickness for service, while at the same time the heat of the smallest fire is communicated immediately to the air chamber. The mode of setting this Furnace we consider essential; more especially the plan of admitting the air to the furnace at its lowest point, as it then rises naturally into the apartments above. This

process commences as soon as the temperature is raised even a single degree. The outer walls remain cold; the floor above is not endangered, and the whole building is rapidly filled with an atmosphere which is at once salubrious and delightful.



Section of Chilson's Furnace.



Elevation. *Section.*

VENTILATING STOVE.

For the houses which we found without the Hot Air Furnaces, as also for the Recitation and other single rooms, the invention of a Stove which should

answer the same purpose became essential. One was therefore contrived; and having been found in its earlier and ruder forms to be of great utility, it has since been improved in its appearance, as well as in the convenience of its management.

These Stoves are composed of two cylinders, the *inner* containing a fire chamber, which is lined with soap-stone or fire brick, while the *outer* constitutes a chamber for warming the air, which is introduced into it beneath the inner cylinder, from an air box directly connected with the external atmosphere.

They possess the following advantages:—

1. They are in fact *furnaces*, having distinct and capacious air chambers.
2. They insure, when properly set, that *supply of fresh air* which is *indispensable to the proper ventilation* of any apartment.
3. The Regulating Distributor, which is movable or fixed, as may be desired, determines with great accuracy the amount and temperature of the admitted air.
4. The outer cylinder is never hot enough to burn the person or clothing, or to be uncomfortable to those who are situated in its immediate vicinity.
5. They are constructed with the utmost regard to efficiency, durability, compactness, and neatness of appearance.

These Stoves have been furnished to the Schools whenever your Committee have required their use, and at manufacturers' prices, without any profit whatever to the inventor and patentee.

They may be used with advantage in the largest rooms, when the cellars are unfit for Furnaces, or when it is preferred to have the fire in the room itself. The Johnson, Wells, Hawes, and Winthrop School-houses are warmed entirely by them.

The discharging ventiducts have been made in various ways; some of wood, some of metal, and others of 'lath and plaster.' Some have opened at the ceiling only, and in but one part of the room, while others have been equally divided at opposite sides of the apartment. Our rule is this:—If the Heating Apparatus is at one end of an oblong room, the ventiduct is placed at the opposite. If the stove or furnace flue is at the middle of the longest side, the ventiducts are placed at each end, and are of course reduced to one half the size of the single one.

The *best* manner of constructing them is shown by the drawing, *Fig.* 1, and described on the following page.

There is great economy in carrying the boxes to the floor in all cases. In this way the room can be kept warm and the air pure in the coldest and most windy days.

The registers at the top and bottom can be used separately or together, as may be desired.

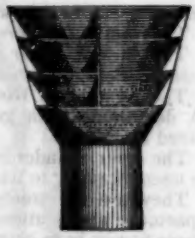
It is necessary and advantageous to apply some kind of cap or other covering upon the ventiducts where they terminate above the roof. It is necessary as a protection from the rain and the down blasts of wind, and it is also very advantageous to be enabled in this way to avail ourselves of the power of the wind to create an active upward current. We used at first the turncap or cowl invented by Mr. Espy, and with satisfactory results. It is undoubtedly the best movable top known; but is noisy, and somewhat liable to get out of working order. These objections to the movable tops have long been known, and various stationary tops have been invented, and have been partially successful. An improved Stationary Top, or Ejecting Ventilator, as it is called, has been invented during the past year by Mr. Emerson. It is shown in the drawing, and consists of the frustrum of a cone attached to the top of a tube, open in its whole extent, and surmounted by a fender which is supported upon rods, and answers the double purpose of keeping out the rain and of so directing or turning a blast of wind upon the structure, as that in what-

Ejecting Ventilator.

ever direction it falls, the effect, that of causing a strong upward draft, will be very uniform and constant.

Being satisfied that this Stationary Ejector possessed all the advantages of the best tops hitherto known, without the disadvantages of either of them, we have adopted it for several of the houses last ventilated, and find it in all respects satisfactory. We therefore recommend it for general use.

The Injector may generally be dispensed with, but in situations unfavorable for introducing air, it may be sometimes found convenient, or even necessary. [Mr. Emerson recommends the use of the Injector, whenever a ventilating stove or furnace is used, so as to secure the admission of a quantity of pure air, warmed by the heating surfaces of the stove or furnace, equal to the quantity of air rendered impure by respiration withdrawn by the Ejector. He refuses to allow his ventilators to be placed upon any school-house which is not supplied with fresh warm air.]



Injecting Ventilators.

Ventiducts.

The discharging ventiducts should be situated at the part of the rooms most distant from the stove or register of the furnace, and should always, if possible, be constructed in or upon an *interior* wall or partition, and an outer brick wall must, if possible, be avoided. They should be made of thoroughly seasoned sound pine boards, smoothed on the inner sides, and put together with two-inch iron screws. The outside finish may be of lath and plaster, or they may be projected backwards into a closet or entry, as shown in Figure 3. They must be carried entirely to the floor, and should be fitted at the top and bottom with a swivel blind, whose capacity is equal to that of the ventiduct into which it opens. This blind may be governed by stay rods or pulleys. The elevation gives a view of the ventiducts for a building of three stories, and shows the best mode of packing them, so as to avoid injuring the appearance of the rooms.

These ventiducts must be *kept entirely separate* to the main discharger at the roof, as any other arrangement would impair or destroy their utility.

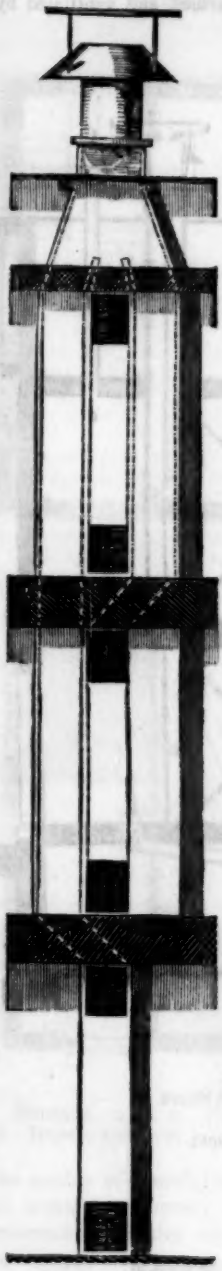
The size of the ventilators and ventiducts must correspond to the capacity of the room, and the number it is intended to accommodate.

A room containing sixty scholars is found to require a discharging duct of fourteen inches in diameter. A room for one hundred scholars requires the tube to be eighteen inches; and a room for two hundred scholars requires it to be twenty-four inches.

The *fresh air ventiducts should exceed in capacity* those for carrying off the impure air by about *fifty per cent.*; so that there will then always be a surplus or plenum supply, and the little currents of cold which press in at the crevices of the doors and windows will be entirely prevented.

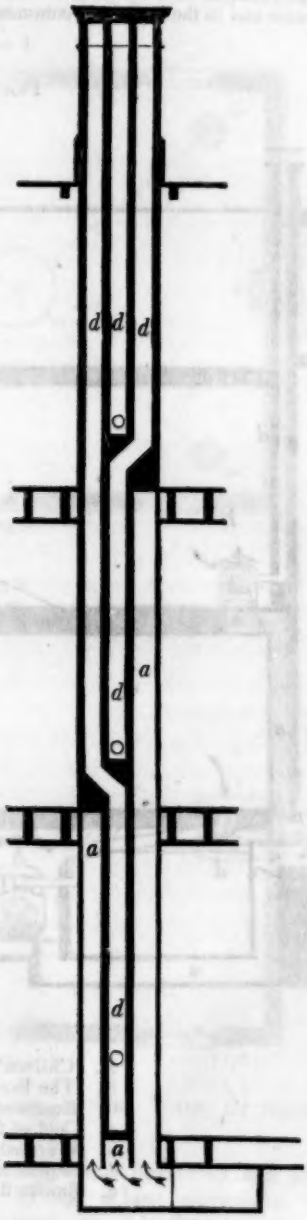
The section shown in Fig. 3 exhibits a very convenient mode of bringing the cold air to the ventilating stoves in a three story building in connection with the smoke flues.

FIGURE 1.



Elevation of Ventiducts.

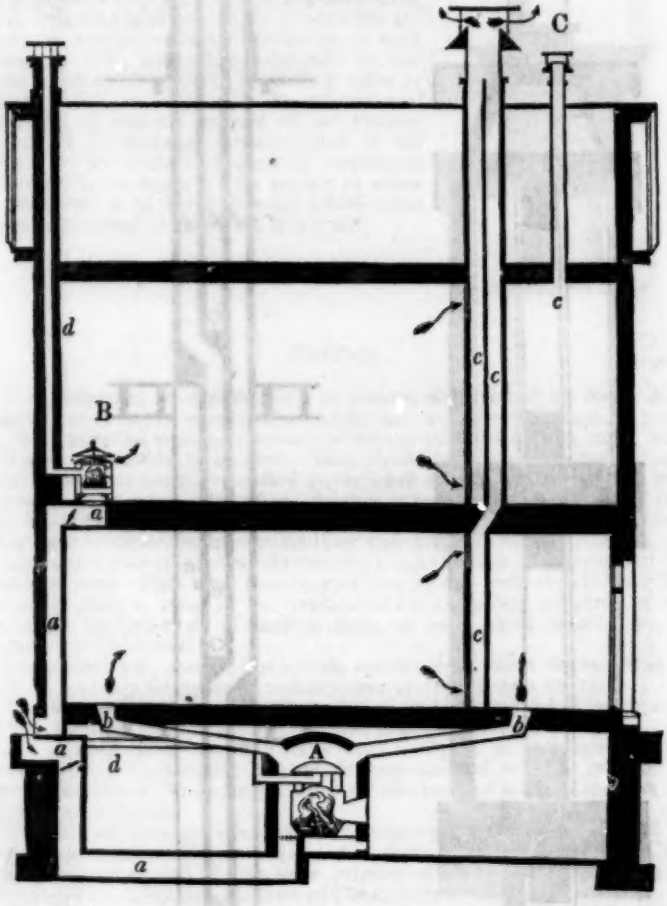
FIGURE 2.



a. Cold air ducts.
d. Smoke flues

The following section, (Fig. 3,) and plans (Fig's. 4 and 5,) exhibit at one view an example of a building of two stories warmed and ventilated by the apparatus and in the manner recommended.

FIGURE 3.

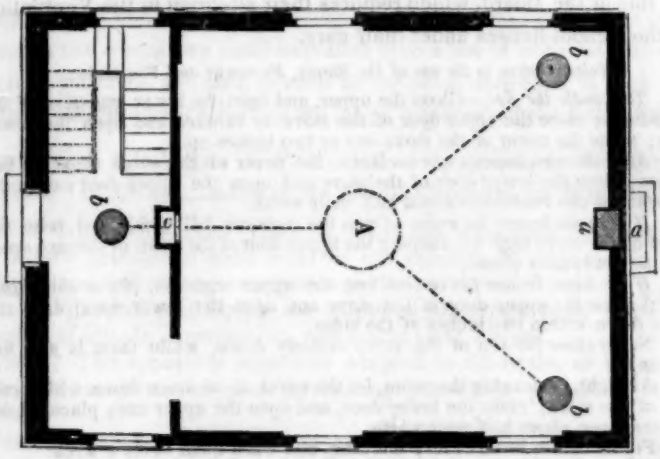


A. Chilson's Furnace.
B. The Boston School Stove.
C. Emerson's Ejector.
a. Cold or fresh air ducts.
b. Warmed air ducts.
c. Impure air ducts.
d. Smoke flues.

The letters on the plans correspond to those in the section.

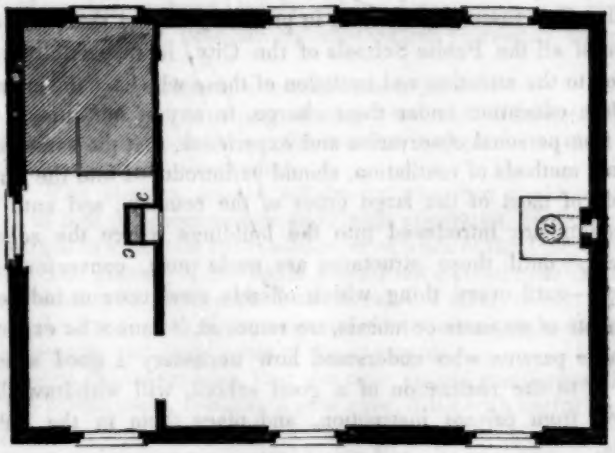
Plans of First and Second Floors.

FIGURE 4.



First Floor.

FIGURE 5.



Second Floor.

A. Furnace. a. a. a. Fresh air ducts. b. b. b. Warm air registers. c. c. c. Impure air ducts.

The modes of ventilation and heating above described and illustrated, were unanimously approved by the school committee, and recommended to the city government, for introduction into the school-houses which may be hereafter erected.

The Committee append to their Report directions for the management of the Stoves, Furnaces and Ventiducts, to which they request the attention of the masters of the Public Schools, in conformity to the rule of the Board, which requires their attention to the Ventilation of the School-houses under their care.

Rules relative to the use of the Stoves, Furnaces and Ventilators.

1. *To kindle the fire.*—Close the upper, and open the lower registers of the ventiducts; close the upper door of the stove or furnace and open the lower door; place the cover of the stove one or two inches up.
2. *After the room becomes warm*—Raise the cover of the stove three or five inches; close the lower door of the stove and open the upper door; open the registers of the ventiducts about half their width.
3. *If the room become too warm*—Open the registers full width, and raise the cover of the stove high up, keeping the upper door of the stove or furnace open, and the lower door closed.
4. *If the room become too cool*—Close the upper registers, (for a short time only;) close the upper door of the stove and open the lower door; drop the cover down within two inches of the sides.
5. Never close the top of the stove entirely down, while there is any fire therein.
6. At night, on leaving the room, let the cover of the stove down within one inch of the sides; close the lower door, and open the upper one; place all the registers open about half their width.
7. Fill the water basins every morning, and wash them twice a week.

The fires should be kept, if possible, through the night, by covering the coal. The coal to be white ash.

The prompt and liberal action of the School Committee, and of the City Government of Boston, in providing for the thorough ventilation of all the Public Schools of the City, is respectfully commended to the attention and imitation of those who have the interests of public education under their charge, in any of our cities. We know from personal observation and experience, that the same, or as effectual methods of ventilation, should be introduced into the Public Schools of most of the large cities of the country; and until improvements are introduced into the buildings where the schools are kept,—until these structures are made neat, convenient and healthy,—until every thing which offends good taste or induces a a bad state of manners or morals, are removed, it cannot be expected that those parents who understand how necessary a good school-house is to the realization of a good school, will withdraw their children from private instruction, and place them in the public schools.

In the High School-house recently erected in Hartford, Connecticut, substantially the same methods of ventilation have been adopted, with a slight variation in the place and form of the Stationary Top or Ejector.

APPARATUS.

As no school-house can be considered complete without such fixtures, and means of experiment and illustration as will enable the teacher to employ the eye and the hand of every pupil in the mastery of the studies pursued in the school, we shall hereafter give a list of such articles as we deem indispensable, and also, of such as we deem desirable, in each grade of school; and in the mean time we invite attention to the following:

EXTRACT *from a "Report on Philosophical Apparatus in the Grammar Schools" of Boston—made to the School Committee in May*, 1847.

"After taking this brief view of what has been done in the schools, we will now proceed to state what in our opinion is required to place this department of instruction upon a proper, and useful basis.

First. The schools should be supplied uniformly with appropriate apparatus of simple construction, and convenient for use.

Second. The apparatus should be adapted to illustrate, as far as practicable, the *most useful and interesting* principles pertaining to the science.

Third. A neat and convenient case, of sufficient size, with glazed doors, should be provided for each set of apparatus.

Much importance is attached by the Committee to the construction and situation of the Apparatus Case, for we consider it useless to provide appropriate apparatus, without also furnishing a proper place to contain it, and have it so arranged, that the instruments can be readily and conveniently used.

We believe the requisites of a useful case to be—

First. Sufficient size to allow of any particular article, being taken out easily and safely; otherwise, the teacher may prefer to *talk* of the principle, rather than to *illustrate* it.

Second. The shelves should not be fixtures, but capable of being moved, so as best to accommodate additional apparatus, or to allow of its being arranged to meet the convenience, or wishes of the teachers.

Third. The glazing of the doors should not extend near the floor on account of liability to accident, and also because a small closet, and a few drawers in the lower part of the case, would be more proper for containing the unseemly, and loose parts of the apparatus.

We deem it important also, that the case should stand upon the platform of the school room, because a neat case, filled with useful philosophical instruments, would add to the attractions of the school, and its prominent position would incline the teacher to have its appearance indicative of order and care. The interest of the pupils would also be awakened in anticipation of experiments, and with the apparatus thus constantly in view, their desire to become acquainted with the study would be increased. In some of the school rooms, the windows are so near together, as to prevent a proper sized case from standing on the platform; it is advisable therefore, that this matter be attended to in the future erection of School Houses.

As a part of the duty assigned them, the Committee have carefully prepared a Schedule of Philosophical Apparatus, embracing all the instruments which they consider necessary, and which having been introduced into several of the schools, and found to be efficient and useful, they submit to the Board with this Report.

The cost of a complete set of apparatus in conformity with this Schedule, will not exceed *two hundred and sixty dollars.*"

Schedule of Philosophical Apparatus for the Grammar Schools.

LAWS OF MATTER.

Apparatus for illustrating Inertia.
Pair of Lead Hemispheres, for Cohesion.
Pair of Glass Plates, for Capillary Attraction.

LAWS OF MOTION.

Ivory Balls on Stand for Collision.
Set of eight illustrations for Centre of Gravity.
Sliding Frame, for Composition of Forces.
Apparatus for illustrating Central Forces.

MECHANICS.

Complete set of Mechanicals, consisting of Pullies; Wheel and Axle; Capstan; Screw; Inclined Plane; Wedge.

HYDROSTATICS.

Bent Glass Tube for Fluid Level.
Mounted Spirit Level.
Hydrometer and Jar, for Specific Gravity.
Scales and Weights, for Specific Gravity.
Hydrostatic Bellows, and Paradox.

HYDRAULICS.

Lifting, or Common Water Pump.
Forcing Pump: illustrating the Fire Engine.
Glass Syphon Cup; for illustrating Intermitting Springs.
Glass, and Metal Syphons.

PNEUMATICS.

Patent Lever Air Pump and Clamp.
Three Glass Bell Receivers, adapted to the Apparatus.
Condensing, and Exhausting Syringe.
Copper Chamber for Condensed Air Fountain.
Revolving Jet and Glass Barrel.
Fountain Glass, Cock, and Jet for Vacuum.
Brass Magdeberg Hemispheres.
Improved Weight Lifter for upward pressure.
Iron Weight of 56 lbs. and Strap, } Weight
Flexible Tube and Connectors, } Lifter.
Brass Plate and Sliding Rod.
Bolt Head and Jar.
Tall Jar and Balloon.
Hand, and Bladder Glasses.
Wood Cylinder and Plate.
India Rubber Bag, for expansion of air.
Guinea and Feather Apparatus.
Glass Flask and Stop Cock, for weighing air.

ELECTRICITY.

Plate Electrical Machine.
Pith Ball Electrometer.
Electrical Battery of four Jars.
Electrical Discharger.
Image Plates and Figure.
Insulated Stool.
Chime of Bells.
Miser's Plate, for shocks.
Tissue Figure, Ball and Point.
Electrical Flyer and Tellurian.
Electrical Sportsman, Jar and Birds.
Mahogany Thunder House and Pistol.
Hydrogen Gas Generator.
Chains, Balls of Pith, and Amalgam.

OPTICS.

Glass Prism; and pair of Lenses.
Dissected Eye Ball, showing its arrangement.

MAGNETISM.

Magnetic Needle on Stand.
Pair of Magnetic Swans.
Glass Vase for Magnetic Swans.
Horseshoe Magnet.

ASTRONOMY.

Improved School Orrery.
Tellurian, or Season Machine.

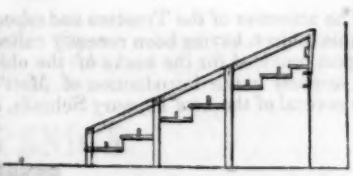
ARITHMETIC, AND GEOMETRY.

Set of 13 Geometrical Figures of Solids.
Box of 64 one inch Cubes, for Cube Root, &c.

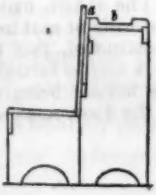
AUXILIARIES.

Tin Oiler; Glass Funnel; Sulphuric Acid.
Set of Iron Weights for Hydrostatic Paradox.

The gallery consists of 7 seats, varying in height from 7 to 9 inches, each seat 20 feet long, and provided with a support for the back. These seats will accommodate 200 children. The whole is set 2½ feet from the wall, and is left open beneath—the space being used as a wardrobe for the youngest children.

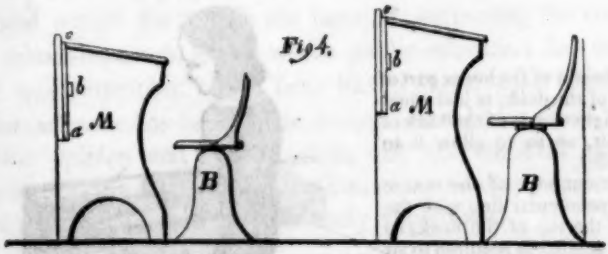


The youngest class is provided with a desk, having a trench (*b*) painted black to contain a thin layer of sand, in which to trace letters, and rude attempts at imitating forms. Each child has a slate, and there is an opening in the top of the desk (*a*) to receive it when not in use.



Since the erection of this school-house some modifications have been made in the construction of the desks and seats. Instead of the long bench for 10 or 12 pupils, each pupil has a chair similar to those represented below.

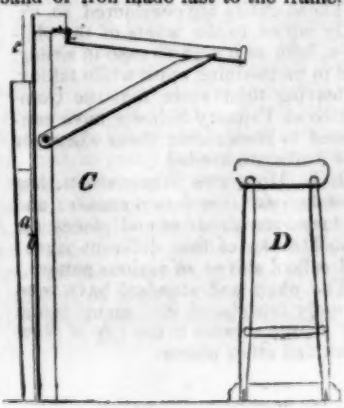
Fig 4.



The desks are 10½ inches wide; and the uprights, or legs, are cut out on the edge towards the chair. The highest desk is 1 foot 7 inches on the lowest side; the lowest 1 foot 5 inches The chairs are 12 and 10 inches. The seat of the chair is about 8 inches wide, and is intended to be set so that the front of the seat and the edge of the top of the desk, shall be perpendicular, one with the other, so that the scholars may sit erect, and receive the benefit of the back of the chair while writing.

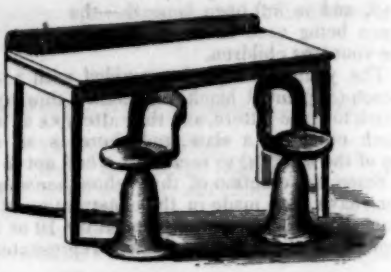
The desks (Fig. 2.) are each for eight scholars and vary in height—the highest, which are most distant from the teacher, being on the lower edge 26 inches from the floor, and requiring a seat 17½ inches; and the lowest being nearest the teacher, being 17 inches and requiring a seat 10 inches from the floor. Each desk has an appropriate place for an inkstand, books, pen, pen-wiper, pencil, and slate for each scholar. The slates are of the best quality, bound over the corners with a band of iron made fast to the frame.

The seats are stools, without backs—all belonging to one desk, being attached to a plank, which can be moved, although it is ordinarily made fast to the floor. There is sufficient space between each stool, and between each range of stools and the adjoining desk, to allow a scholar to leave or take his seat without disturbing any other.



The monitors' seat and desk (F) are elevated about five inches above the rest, so as to command a view of each range of scholars' seats and desks. The top of the monitors' desk is hung with hinges, and supported by a movable brace.

The attention of the Trustees and especially of a committee having charge of this subject, having been recently called to the importance of having some support provided for the backs of the older as well as the younger scholars, has resulted in the introduction of *Mott's patent revolving cast-iron chair* into several of the new Primary Schools, and into one of the Public Schools.



The chairs, except the seat, are made of cast iron, and are so constructed, that the seat and back may be turned round, while the bottom being screwed fast to the floor, remains stationary.

The height of the lower part of the top of the desk, is just equal to the highest part of the back of the chair, so as to allow it to pass under.

The front edge of the seat is in a perpendicular line with the edge of the top of the desk, so that the scholar is required to sit erect, when engaged in writing or studying, and the same time that part of his back which requires support is fully in contact with the chair.

These chairs are made of four sizes as follows—

No 1 is 10	in.	high,	and	requires	a	desk 17	in.
" 2 " 12	"	"	"	"	"	19½	"
" 3 " 14	"	"	"	"	"	22	"
" 4 " 16	"	"	"	"	"	24	"

These chairs are considered so exactly suited to the wants of the children, both as it regards ease in sitting, and in maintaining order while taking, or leaving their seats, that the Committee on Primary Schools have concluded to recommend them wherever new desks are needed.

J. L. Mott, 264 Water-street, has for sale *cast iron lesson stands*; and *cast iron standards* or end pieces for school desks of four different sizes; and school stoves of various patters.

The chair and standard have been recently introduced into many public and private schools in the city of New York and other places.

APPENDIX.

LEST the author should be thought to exaggerate the deficiences of school-houses as they have been heretofore constructed, and as they are now almost universally found wherever public attention has not been earnestly, perseveringly, and judiciously called to their improvement, the following extracts from recent official school documents are inserted, respecting the condition of school-houses in States where public education has received the most attention. The facts herein stated show that, while some advance has been made within a few years past, both in public opinion and public action, still the standard of actual attainment is very low, and the disastrous consequences of neglect are not sufficiently, or generally appreciated.

MASSACHUSETTS.

EXTRACTS *from the "Report of the Secretary (Hon. Horace Mann) of the Board of Education for* 1846."

"For years the condition of this class of edifices, throughout the State, taken as a whole, had been growing worse and worse. Time and decay were always doing their work, while only here and there, with wide spaces between, was any notice taken of their silent ravages; and, in still fewer instances, were these ravages repaired. Hence, notwithstanding the improved condition of all other classes of buildings, general dilapidation was the fate of these. Industry and the increasing pecuniary ability which it creates, had given comfort, neatness, and even elegance to private dwellings. Public spirit had erected commodious and costly churches. Counties, though largely taxed, had yet uncomplainingly paid for handsome and spacious court-houses and public offices. Humanity had been at work, and had made generous and noble provision for the pauper, the blind, the deaf and dumb, the insane. Even jails and houses of correction,—the receptacles of felons and other offenders against the laws of God and man, had, in many instances, been transformed, by the more enlightened spirit of the age, into comfortable and healthful residences. The Genius of architecture, as if she had made adequate provision for all mankind, extended her sheltering care over the brute creation. Better stables were provided for cattle, better folds for sheep, and even the unclean beasts felt the improving hand of reform. But in the mean time the school-houses, to which the children should have been wooed by every attraction, were suffered to go where age and the elements would carry them.

In 1837, not one third part of the Public School-houses in Massachusetts would have been considered tenantable by any decent family, out of the poor-house, or in it. As an incentive to neatness and decency, children were sent to a house whose walls and floors were indeed painted, but they were painted, all too thickly, by smoke and filth; whose benches and doors were covered with carved work, but they were the gross and obscene carvings of impure hands; whose vestibule, after the oriental fashion, was converted into a veranda, but the metamorphosis which changed its architectural style, consisted in laying it bare of its outer covering. The modesty and chastity of the sexes, at their tenderest age, was to be cultivated and cherished, in places, which oftentimes were as destitute of all suitable accommodations, as a camp or a caravan. The brain was to be worked amid gases that stupefied it. The virtues of generosity and forbearance were to be acquired where sharp discomfort and pain tempted each one to seize more than his own share of relief, and thus to strengthen every selfish propensity.

At the time referred to, the school-houses in Massachusetts were an opprobrium to the State; and if there be any one who thinks this expression too strong, he may satisfy himself of its correctness by inspecting some of the few specimens of them which still remain.

The earliest effort at reform was directed towards this class of buildings. By presenting the idea of taxation, this measure encountered the opposition of one of the strongest passions of the age. Not only the sordid and avaricious, but even those, whose virtue of frugality, by the force of habit, had been imperceptibly sliding into the vice of parsimony, felt the alarm. Men of fortune, without children, and men who had reared a family of children, and borne the expenses of their education, fancied they saw something of injustice in being called to pay for the education of others; and too often their fancies started up into spectres of all imaginable oppression and wrong. The school districts were the scene where the contending parties arrayed themselves against each other; the school-house itself their arena. From time immemorial, it had been the custom to hold school district meetings in the school-house. Hither, according to ancient usage, the voters were summoned to come. In this forum, the question was to be decided, whether a new edifice should be erected, or whether the ability of the old one to stand upon its foundations for another season, should be tried. Regard for the health, the decent manners, the intellectual progress and the moral welfare of the children, common humanity, policy, duty, the highest worldly interests of the race, were marshalled on one side, demanding a change; selfishness, cupidity, insensibility to the wants and the welfare of others, and that fallacious plea, that because the school-house had answered the purpose so long, therefore it would continue to answer it still longer,—an argument which would make all houses, and roads, and garments, and every thing made by human hands, last forever,—resisted the change. The disgraceful contrast between the school-house and all other edifices, whether public or private, in its vicinity; the immense physical and spiritual sacrifices which its condition inflicted upon the rising generation, were often and unavailingly urged; but there was always one argument which the advocates for reform could use with irresistible effect,—the school-house itself. Cold winds, whistling through crannies and chinks and broken windows, told with merciless effect upon the opponents. The ardor of opposition was cooled by snow-blasts rushing up through the floor. Pain-imparting seats made it impossible for the objectors to listen patiently even to arguments on their own side; and it was obvious that the tears they shed were less attributable to any wrongs which they feared, than to the volumes of smoke which belched out with every gust of wind from

broken funnels and chimneys. Such was the case in some houses. In others, opposite evils prevailed; and the heat and stifling air and nauseating effluvia were such as a grown man has hardly been compelled to live in, since the time of Jonah.

Though insensible to arguments addressed to reason and conscience, yet the senses and muscles and nerves of this class of men were less hardened than their hearts; and the colds and cramps, the exhaustion and debility, which they carried home, worked mightily for their conversion to truth. Under such circumstances, persuasion became compulsory.

Could the leaders of the opposition have transferred the debate to some commodious public hall, or to their own spacious and elegant mansions, they might have bid defiance to humanity and remained masters of the field. But the party of reform held them relentlessly to the battle-ground; and there the cause of progress triumphed, on the very spot where it had been so long dishonored.

During the five years immediately succeeding the report made by the Board of Education to the Legislature, on the subject of school-houses, the sums expended for the erection or repair of this class of buildings fell but little short of *seven hundred thousand dollars*. Since that time, from the best information obtained, I suppose the sum expended on this one item to be about *one hundred and fifty thousand dollars annually*. Every year adds some new improvement to the construction and arrangement of these edifices.

In regard to this great change in school-houses,—it would hardly be too much to call it a *revolution*,—the school committees have done an excellent work,—or rather, they have begun it;—it is not yet done. Their annual reports, read in open town meeting, or printed and circulated among the inhabitants, afterwards embodied in the Abstracts and distributed to all the members of the government, to all towns and school committees have enlightened and convinced a State.

NEW-YORK.

EXTRACT *from the "Annual Report of the Superintendent (Hon. Samuel Young) of Common Schools, made to the Legislature, January* 13, 1844."

"The whole number of school-houses visited and inspected by the county superintendents during the year was 9,368: of which 7,685 were of framed wood; 446 of brick; 523 of stone, and 707 of logs. Of these, 3,160 were found in good repair; 2,870 in ordinary and comfortable repair, and 3,319 in bad repair, or totally unfit for school purposes. The number furnished with more than one room was 544, leaving 8,795 with one room only. The number furnished with suitable play-grounds is 1,541; the number not so furnished, 7,313. The number furnished with a single privy is, 1,810; those with privies containing separate apartments for male and female pupils, 1,012; while the number of those not furnished with *any privy* whatever, is 6,423. The number suitably furnished with convenient seats, desks, &c., is reported at 3,282, and the number not so furnished, at 5,972. The number furnished with proper facilities for ventilation is stated at 1,518; while the number not provided with these essential requisites of health and comfort is 7,889.

No subject connected with the interests of elementary instruction affords a source of such mortifying and humiliating reflections as that of the condition of a large portion of the school-houses, as presented in the above enumeration. One-third only of the whole number visited, were found in good repair; another third in ordinary and comfortable condition

only in this respect—in other words, barely sufficient for the convenience and accommodation of the teachers and pupils; while the remainder, consisting of 3,319, were to all intents and purposes unfit for the reception of man or beast.

But 544 out of 9,368 houses visited, contained more than one room; 7,313 were destitute of any suitable play-ground; nearly six thousand were unfurnished with convenient seats and desks; nearly eight thousand destitute of the proper facilities for ventilation; and upwards of six thousand without a privy of any sort; while of the remainder but about one thousand were provided with privies containing different apartments for male and female pupils! And it is in these miserable abodes of accumulated dirt and filth, deprived of wholesome air, or exposed without adequate protection to the assaults of the elements, with no facilities for necessary exercise or relaxation, no convenience for prosecuting their studies; crowded together on benches not admitting of a moment's rest in any position, and debarred the possibility of yielding to the ordinary calls of nature without violent inroads upon modesty and shame; that upwards of two hundred thousand children, scattered over various parts of the State, are compelled to spend an average period of eight months during each year of their pupilage! Here the first lessons of human life, the incipient principles of morality, and the rules of social intercourse are to be impressed upon the plastic mind. The boy is here to receive the model of his permanent character, and to imbibe the elements of his future career; and here the instinctive delicacy of the young female, one of the characteristic ornaments of the sex, is to be expanded into maturity by precept and example! Is it strange, under such circumstances, that an early and invincible repugnance to the acquisition of knowledge is imbibed by the youthful mind; that the school-house is regarded with unconcealed aversion and disgust, and that parents who have any desire to preserve the health and the morals of their children, exclude them from the district school, and provide instruction for them elsewhere?

If legislation could reach and remedy the evil, the law-making power would be earnestly invoked. But where the ordinary mandates of humanity, and the laws of parental feeling written by the finger of heaven on the human heart, are obliterated or powerless, all statutory provisions would be idle and vain. In some instances during the past year, comfortable school-houses have been erected to supply the place of miserable and dilapidated tenements which for years had been a disgrace to the inhabitants. Perhaps the contagion of such worthy examples may spread; and that which seems to have been beyond the influence of the ordinary impulses of humanity, may be accomplished by the power of example or the dread of shame.

The expense of constructing and maintaining convenient buildings, and all other proper appliances for the education of the young, is a mere trifle when contrasted with the beneficial results which inevitably follow.

Of all the expenditures which are calculated to subserve the wants or gratify the caprices of man, there are none which confer such important and durable blessings as those which are applied to the cultivation and expansion of the moral and intellectual powers. It is by such cultivation that human happiness is graduated, and that from the most debased of the savage tribes, nation rises above nation in the scale of prosperity and civilization. The penuriousness which has been manifested on this subject, and the reckless profligacy exhibited on others, is strongly characteristic of the past. In future times, when the light of science shall be more widely diffused, and when the education of the young shall claim and receive the consideration it deserves, a retrospection to the records of the past will exhibit preceding generations in no enviable point of view.

The following remarks and extracts from the Reports of the special visiters appointed by the State Superintendent (Hon. John C. Spencer) in each of the counties, for 1840, and for 1841, are taken from Part I of that admirable work, the "School and the Schoolmaster," Part I, by Prof. (now Bishop) Potter, and Part II, by George B. Emerson, Esq., of Boston.

"I ask, then, *first*, are our common schools places of agreeable resort, calculated to promote health, and to connect pleasant associations with study?

Ans. Say the visiters, in one of the oldest and most affluent towns of the south-eastern section of the state, 'It may be remarked, generally, that the school-houses are built in the old style, are too small to be convenient, and, with one exception, too near the public roads, generally having no other play-ground.' Twelve districts were visited in this town.—*See Report of Visiters* (1840), p. 47.

Say the visiters of another large and wealthy town in the central part of the state, 'Out of the 20 schools they visited, 10 of the school-houses were in bad repair, and many of them not worth repairing. In none were any means provided for the ventilation of the room. In many of the districts, the school-rooms are too small for the number of scholars. The location of the school-houses is generally pleasant. There are, however, but few instances where play-grounds are attached, and their condition as to privies is very bad. The arrangement of seats and desks is generally very bad, and inconvenient to both scholars and teachers. Most of them are without backs.'—P. 28 (*Rep.*, 1840.)

From another town in the north-western part of the state, containing a large population, and twenty-two school districts, the visiters report of district No. 1, that the school-house is large and commodious, but scandalously cut and marked; the school-room but tolerably clean; the privies very filthy, and no means of ventilation but by opening the door or raising the window. No. 2 has an old school-house; the room not clean; seats and desks well arranged, but cut and marked; no ventilation; the children healthy, but not clean. No. 3 has an old frame building, but warm and comfortable. No. 4 has a very poor, dilapidated old frame school-house, though the inhabitants are generally wealthy for that country. No. 5 has a frame school-house, old and in bad condition; school-room not clean; seats and desks not convenient; No. 6 has a frame school-house, old and in bad condition; the school-room is not clean; no cup or pail for drinking water. No. 7 has a log school-house, in a very bad condition; desks and seats are inconvenient. 'Here, too,' say the visiters, 'society is good, and people mostly in easy circumstances, but the school-house very unbecoming such inhabitants. It does not compare well with their dwellings.' No. 8, say the visiters, is 'a hard case.' No. 9 has a frame house in good condition and in a pleasant location, but is 'too small for the number of children.' No. 10 has a log school-house. No. 11 has a 'log shanty for a school-house, not fit for any school.' No. 12 a log house. No. 13 has a log shanty, in bad condition, not pleasantly located, school-room not clean. 'The school-house or *hovel* in this district is so cold in winter, so small and inconvenient, that little can be done towards preserving order or advancing education among so many scholars; some poor inhabitants and some in good circumstances; might have a better school-house.' No. 14 has a good frame house, in good condition, pleasant location, with ample and beautiful play-ground; school-room in clean condition. The visiters add, 'In this district the inhabitants are

poor, and the scholars attend irregularly; *the house was built by one man in low circumstances, who has a large family of boys to educate; a noble act.*' No. 15 has a frame house, in a good, warm, and comfortable condition, with a pleasant and retired location and a play-ground. No. 16 has a log shanty for a school-house. No. 17, 'no regular school-house other than some old log house.' No. 18, no school-house. No. 19, a log shanty. No. 20 and 21 are new districts. No. 22 has a frame school-house, in good repair and pleasantly situated. Thus, out of twenty-two school-houses, not more than *five* are reported as respectable or comfortable; none have any proper means of ventilation; eight are built of logs; and but one of them, according to the visiters, has a privy.—*Report* (1840), p. 142.

It is also a subject of frequent complaint in these reports, that the seats are too high (too high, say the visiters in one case, for a man of six feet, and all alike), and are, therefore, uncomfortable for the children, as well as productive of much disorder. 'We have found,' says the report from one town, 'except in one school, all the seats and desks much too high, and in that one they were recently cut down at our recommendation. In many of our schools, a considerable number of children are crowded into the same seat, and commonly those seated beyond the entering place have no means of getting at their seats but by climbing over those already seated, and to the ruin of all regard to cleanliness.'

'We have witnessed much uneasiness, if not suffering, among the children, from the dangling of their legs from a high seat, and, with the one exception, have seen them attempting to write on desks so high that, instead of the elbow resting to assist the hand in guiding the pen, the whole arm has, of necessity, been stretched out; for, if they did not this, they must write rather by guess than sight, unless some one may have the fortune to be near-sighted, and, from this defect, succeed in seeing his work. This is a great evil, and ought to be remedied before we complain of the incompetency of teachers.'—*Report* (1841), p. 38.

These specimens will serve to show how far many of the school-houses, in this state, are pleasant places of resort, or study, and in what degree they are likely to inspire a respect for education, or a desire to enjoy and improve its advantages. The condition and aspect of the building, with its appendages and surrounding landscape, are inseparably associated, in a child's mind, with his first day at school, and his first thoughts about education. Is it well, then, that these earliest, most lasting, and most controlling associations, should be charged with so much that is offensive? Is it to be expected, that the youthful mind can regard that as the cause, next to religion, most important of all others, which is upheld and promoted, in such buildings, as the district school-house usually is? Among the most comfortless and wretched tenements, which the pupil ever enters, he thinks of it with repugnance; the tasks which it imposes, he dreads; and he at length takes his leave of it, as of a prison, from which he is but too happy to escape.

This seems to me to be the greatest evil connected with our school-houses. But their deleterious effect on health, is also to be considered. Air which has been once respired by the lungs, parts with its healthy properties, and is no longer fit for use. Hence a number of persons, breathing the air of the same apartment, soon contaminate it, unless the space is very large, or unless there is some provision for the introduction of fresh, as well as the exclusion of foul air. This ventilation is especially important for school-houses, since they are usually small in proportion to the number of scholars; the scholars remain together a long while at once, and are less cleanly in their personal habits than adults. Yet, important as it is, probably not one common school in fifty, in this state,

will be found supplied with adequate means to effect it. The cracks and crevices, which abound in our school-houses, admit quite enough of cold air in winter, but not enough of fresh. What is wanted at that season, for both health and economy, is a constant supply of fresh warm air; and this is easily obtained by causing the air, as it enters from without, to pass through heated flues, or over heated surfaces.

It is also important, to the health of scholars and teachers in common schools, that the rooms should be larger and have higher ceilings; and that much more scrupulous attention should be paid to the cleanliness of both the room and its inmates. 'An evil,' say the visiters of one of the towns, 'greater than the variety of school-books or the want of necessary apparatus, is having school-rooms so unskilfully made and arranged. Of our 13 school-rooms, only 3 are ten feet high, and of the residue only one is over eight feet. The stupidity arising from foul, oft-breathed air, is set down as a grave charge against the capacity of the scholars or the energy of the teacher. A room for 30 children, allowing 12 square feet for each child, is low at 10 feet, and for every additional ten children an extra foot in elevation is absolutely necessary, to enable the occupants of the room to breathe freely.'—*Report* (1841), p. 38.

Are common schools so conducted, as to *promote habits of neatness and order, and cultivate good manners and refined feelings?*

From the quotations already made from the reports of visiters, it appears that the school-rooms, in many cases, were not clean; and the same thing is often alleged of the children. I will add but one other passage, to which I happen to open on p. 39 of the Report (1840). It relates to a town containing 24 school districts, of which 16 were visited. Of these 16, one quarter are represented to have been almost entirely regardless of neatness and order, viz.: No. 4 'has a dirty school-room, and the appearance of the children was dirty and sickly.' No. 2 'has a dirty school-room, inconveniently arranged, and *ventilated all over*;' the children 'rather dirty,' and no means of supplying fresh water except from the neighbor's pails and cups. No. 3 has 'an extremely dirty school-room, without ventilation, the children not clean, and no convenience for water.' No. 24 'has a school-house out of repair, dirty, and inconvenient in its arrangements.'

It is also a subject of almost universal complaint, that the *school-houses are without privies.* On an average, probably not more than one in twenty, of the school-houses throughout the state, has this appendage; and in these, it was almost invariably found, by the visiters, to be in a bad state. This fact speaks volumes, of the attention, which is paid at these schools, to delicacy of manners, and refinement of feeling. None but the very poorest families think of living without such a convenience at home; and a man, who should build a good dwelling-house, but provide no place for retirement when performing the most private offices of nature, would be thought to give the clearest evidence of a coarse and brutal mind. Yet respectable parents allow their children to go to a school where this is the case; and where the evil is greatly aggravated by the fact, that numbers of both sexes are collected, and that, too, at an age of extreme levity, and when the youthful mind is prone to the indulgence of a prurient imagination. Says one of the visiters (*Report*, 1840, p. 77), 'In most cases in this town, the scholars, male and female, are turned promiscuously and simultaneously into the public highway, without the shelter of so much (in the old districts) as a 'stump' for a covert to the calls of nature. The baneful tendency, on the young and pliant sensibilities, of this barbarous custom, are truly lamentable.' So the visiters of one of the largest and oldest counties: 'We regret to perceive that many of the districts have neglected to erect privies for the use of the children at

school. This is a lamentable error. The injury to the taste and morals of the children which will naturally result from this neglect, is of a character much more serious than the discomfort which is obviously produced by it.'—(*Report*, 1840, p. 131.)"

VERMONT.

EXTRACT *from the "First Annual Report of the State Superintendent (Hon. Horace Eaton,) of Common Schools, October*, 1846," *made to the Legislature.*

"It might occur to any one in travelling through the State, that our school-houses are almost uniformly located in an uninteresting and unsuitable spot, and that the buildings themselves too generally exhibit an unfavorable, and even repulsive aspect. Yet by giving some license to the imagination it might be supposed that, notwithstanding their location and external aspect were so forbidding, the internal appearance would be more cheerful and pleasant—or at least, that the arrangement and construction within would be comfortably adapted to the purposes which the school-house was intended to fulfil. But an actual inspection of by far the greatest number of the school-houses in the State, by County Superintendents, discloses the unpleasant fact, that ordinarily the interior does but correspond with the exterior, or is, if possible, still worse. A very large proportion of these buildings throughout the State must be set down as in a miserable condition. The melancholy fact is established by the concurrent report of all our County Superintendents, that in every quarter of the State they are, as a class, altogether unsuited to their high purposes. Probably nine-tenths of them are located upon the line of the highway; and as the geographical centre of the district usually determines their situation, aside from the relation with the road, it is a rare chance that one is not placed in an exposed, unpleasant and uncomfortable spot. In some cases—especially in villages—their location seems to be determined by the worth, or rather by the *worthlessness* of the ground on which they stand—that being selected which is of the least value for any other purpose. Seldom or never do we see our school-houses surrounded by trees or shrubbery, to serve the purpose which they might serve so well—that of delighting the eye, gratifying the taste, and contributing to the physical comfort, by shielding from the scorching sun of summer, and breaking the bleak winds of winter. And from buildings thus situated and thus exposed, pupils are turned out into the streets for their sports, and for other purposes still more indispensable. What better results could be expected under such a system than that our 'girls should become hoydens and our boys blackguards?' Indeed it would be a happy event, if in no case results still more melancholy and disastrous than this were realized.

But this notice of *ordinary* deficiencies does not cover the whole ground of error in regard to the situation of school-houses. In some cases they are brought into close connection with positive nuisances. In a case which has fallen under the Superintendent's own personal observation, one side of the school-house forms part of the fence of a hog-yard, into which, during the summer, the calves from an extensive dairy establishment have been thrown from time to time, (disgusting and revolting spectacle!) to be rent and devoured before the eyes of teacher and pupils—except such portions of the mutilated and mangled carcasses as were left by the animals to go to decay, as they lay exposed to the sun and storm. It is true the windows on the side of the building adjoining the yard, were generally observed to be closed, in order to shut out the

almost insupportable stench which arose from the decomposing remains. But this closure of windows could, in no great degree, 'abate the nuisance;' for not a breath of air could enter the house from any direction but it must come saturated with the disgusting and sickening odor that loaded the atmosphere around. It needs no professional learning to tell the deleterious influence upon health, which must be exerted by such an agency, operating for continuous hours.

Such cases, it is hoped and believed, are exceedingly rare. But it is much to be feared that the usual exemption enjoyed by teachers and pupils, from even such outrages upon their senses and sensibilities, as have been detailed, is to be attributed to the fact that such arrangements are not ordinarily convenient, rather than to any prevailing conviction of their impropriety, or any general and settled purpose to avoid them. The case is named as at least strong evidence that the pertinency of considerations, involving a regard either to taste, comfort, or even health itself, is generally overlooked or disregarded, in fixing upon a site for a school-house. At all events these purposes are all *exposed* to be violated under the prevailing neglect of districts to secure the possession of sufficient ground for a yard around the school-house. But it would seem unnecessary to urge, beyond the bare suggestion, the importance of providing for school-houses, a comfortable location, a sufficient yard and play-ground, a wood-house and other out-buildings, a convenient access to water, and the surrounding of the premises with shade-trees which might serve for shelter, as well as delight the eye, and aid to render the school-house—what it should be—one of the most attracting and delightful places of resort upon the face of the earth. It should be such, that when the child shall have changed into the gray-haired man, and his memory wanders back through the long vista of vanished years, seeking for some object on which it may repose, this shall be the spot where it shall love to rest.

In the construction of the school-house—embracing its material, style of architecture, and finish—as little care and taste are exhibited, as might be expected from the indifference manifested in regard to its location and surrounding circumstances. Cheapness of construction seems, in most cases, to be the great governing principle, which decides upon its materials, its form, and all its internal arrangements. No complaint on this score could justly be made, if the general condition of these buildings were clearly and fairly attributed to want of ability. But while our other edifices, both public and private, have improved in elegance, convenience, and taste, with the increasing wealth of our citizens, our school-houses linger in the rear and bear the impress of a former age. In this respect

> 'That which in days of yore we were
> We at the present moment are.'

Low walls might be instanced as *one* of the prevailing defects in school-house architecture. The quantity of air contained in a school-room of the usual height, is so small as to be soon exhausted of its oxygen; and the dullness, headache and depression which succeed to this result, are but too well known and too often felt, although they may fail of being attributed to their true cause. And why should our children be robbed of a comfortable supply of that pure and wholesome air, with which our Creator, in the largeness and richness of his bounty, has surrounded the earth and filled the sky? But if the condition of the house is such, as in part to prevent the injurious effects arising from a deficiency of pure air, by means of broken windows and gaping crevices—then colds, coughs and as the ultimate and crowning result—consumption—

(and of this disease, what thousands of cases have had their foundations laid in the school-house!) must be the consequence of this sort of exposure. This is true in regard to *all* classes and conditions of pupils. But it should be distinctly kept in mind, although it is ordinarily overlooked and forgotten, that children accustomed to be comfortably protected against cold or vicissitudes of temperature, at home, will inevitably suffer the more when exposed to them in the school-house. And here is an additional reason why these structures should be improved, as our dwelling houses are generally becoming more comfortable.

But there is not room here for details—not even to exhibit *this* topic in all its important bearings. And it has been thus hinted at only to prove that the general charge of faulty construction is not wholly unfounded.

It was the purpose of the Superintendent to discuss at some length, the pernicious influence exerted, both upon the health of pupils, and their progress in learning, by the miserable structures in which the State abounds, but the extent of the remarks already made precludes it.

One cause of the prevailing fault in regard to the construction and internal arrangement of school-houses, doubtless, is the want of proper models. Districts, when about erecting a school-house, cannot well do more than follow the examples before them. To form the plan of a proper school-house—one well adapted to all the various ends which should be sought, such as the convenience, comfort, and health of pupils, convenience for supervision and conduct of the school, and facilities for the most successful prosecution of study—would require such an extent of observation and so full an acquaintance with the laws of health, of mind and morals—and then such a skill in designing a structure in which all the necessary conditions should be observed and secured, that it would be unreasonable to expect that a district could command them, without an opportunity to avail itself of the experience and observation of others. And districts have almost universally felt this lack of guidance. But it is believed that hereafter, information on the subject of school-house architecture, will be more accessible; and if, as a first step, some one district in every town in the State would avail itself of the necessary information, and make a vigorous effort to secure the erection of a well located, well planned, and well constructed school-house, they would perform an act of high public beneficence, as well as confer upon themselves an inestimable blessing. And shall not one or two years realize the accomplishment of this noble purpose? What district will lead the van?

NEW HAMPSHIRE.

EXTRACTS *from the "Report of the Commissioner, (Prof. Haddock, of Dartmouth College) of Common Schools, to the Legislature of New Hampshire, June Session*, 1847."

"The success of our whole system depends as much on a thorough reform in the construction and care of school-houses as upon any other single circumstance whatever.

It is wonderful, and when their attention is called to it, strikes the inhabitants of the Districts themselves as really unaccountable, that careful and anxious parents have been content to confine their children for so many hours a day through a large part of the severest and most trying seasons of the year, in houses so ill constructed, so badly ventilated, so imperfectly warmed, so dirty, so instinct with vulgar ideas, and so utterly repugnant to all habits of neatness, thought, taste, or purity. There are multitudes of houses in the State, not only inconveniently located, and awkwardly planned, but absolutely dangerous to health and morals.

And it has struck me with the greater surprise, that this is true not only of the thinly peopled parts of the State, but of flourishing villages. In one of the largest towns the principal District School was kept, the last winter, in a dilapidated, rickety, uncouth, slovenly edifice, hardly more comfortable than some barns within sight of it. In one enterprising village the school-house, as I looked at it from a little distance, appeared decidedly the shabbiest and most neglected building, not to say dwelling, within reach of my eye. I have been in houses, which no scrubbing could keep clean; they were never made to be clean: and this, in places, where private taste is adorning the town with the ornaments of architecture and enriching the country with the fruits of rural industry.

It is, however, encouraging to find, that a better feeling is coming to prevail on this subject. Many districts are rebuilding, and, in most instances, upon an improved plan. Some examples have been set of good judgment and liberal expenditure for this important object. And it is hoped, that other districts will be stimulated to imitate them.

Whenever a new house is to be erected, it should first be carefully located, so as best to accommodate the whole district, and by all means, on an open, healthy, agreeable site, with ample room about it on all sides, and out of the way of floods of water or of dust. The young spirit loves the free air and the cheerful day; and when confined, as for some six hours it must be, the confinement should be as little unnatural and unwholesome as possible. The cheapest medicine for the body is good air and plenty of room; and the most indispensable pre-requisite to sane thought is a beautiful and happy place to think in. The house itself should be large; so large that the vacant floor may about equal the space occupied by the seats. The difference of ten feet in length is not great in point of expense; in point of comfort it may be incalculable. The walls should be twelve feet high at least; and an opening made in the ceiling for the escape of the overheated and corrupted air. This should be made to be closed at pleasure. Not more than two scholars should sit on one seat; and the seats should be roomy and easy. These are the great points in a school-house. If the architecture is neat, and the grounds tastefully laid out, and every depredation immediately repaired, every stain removed at once, not only will the house answer the essential purposes of health and comfort, but prove a material auxiliary in elevating the minds and correcting the habits of those who receive their education in it."

CONNECTICUT.

EXTRACT *from the "First Annual Report of the Secretary of the Board of Commissioners of Common Schools, for* 1838-39.

"In the whole field of school improvement there is no more pressing need of immediate action than here. I present with much hesitation, the result of my examinations as to several hundred school-houses in different parts of the State. I will say, generally, that the location of the school-house, instead of being retired, shaded, healthy, attractive, is in some cases decidedly unhealthy, exposed freely to the sun and storm, and in nearly all, on one or more public streets, where the passing of objects, the noise and the dust, are a perpetual annoyance to teacher and scholar, —that no play-ground is afforded for the scholar except the highway,— that the size is too small for even the *average* attendance of the scholars, —that not one in a hundred has any other provision for a constant supply of that indispensable element of health and life, pure air, except the rents and crevices which time and wanton mischief have made; that the

seats and desks are not, in a majority of cases, adapted to children of different sizes and ages, but on the other hand are calculated to induce physical deformity, and ill-health, and not in a few instances (I state this on the authority of physicians who were professionally acquainted with the cases,) have actually resulted in this—and that in the mode of warming rooms, sufficient regard is not had either to the comfort and health of the scholar, or to economy.

That I have not stated these deficiencies too strongly, I beg leave to refer you to the accompanying returns, respecting the condition of school-houses in more than eight hundred districts in the State, and in more than forty particulars in each. These returns were made from actual inspection and measurement of school-houses by teachers and others. An abstract of them in part will be found annexed, together with extracts from letters received from school officers on the subject. I might accumulate evidence of the necessity of improvement here for every district in the State. Without improvement in many particulars which concern the health, the manners and morals of those who attend school, it is in vain to expect that parents who put a proper estimate, not only on the intellectual, but the physical and moral culture of their children, will send to the district school. It is not to be wondered at that children acquire a distaste for study and a reluctance to attend school, so long as school-houses are associated with hours of prolonged weariness and actual suffering from a scanty supply of pure air, and seats and desks so arranged and constructed as to war against their physical organization. These things are not forgotten by parents in the construction of churches, nor have the public neglected to provide for a constant supply of pure air in the work-shops and sleeping-rooms of the State Prison at Wethersfield, or the County Gaol at Hartford."

The following extracts are from the communications referred to in the above Report:

"In one hundred and four districts in one county, there are thirty-one school-houses which may be considered as being in very good repair, and seventy-three of which are more or less out of repair. Among them there are but seven which are constructed in such a manner as to be comfortable and convenient. In three the scholars all face the teacher, and in six or seven others, they sit so as to face the centre of the room. In the others the desks are confined to the walls on three sides of the room, and have seats in front of them. By this arrangement the larger scholars sit with their backs to the teacher, except while engaged in reading and spelling. In the first position they have no support at all for the back, and in the latter, the edge of the desk is all that is afforded. The younger scholars are seated in the centre of the room on low seats, which in eighty districts are provided with backs. In the remaining twenty-four districts, these seats have not backs. In eight districts, two rooms are occupied by the school, and in ninety-six districts, only one room. The rooms used, will average about twenty feet square, and eight feet in height. In seventy-five districts, close stoves are used for warming the houses, and in twenty-three, stoves and fire-places, and in six, fire-places alone. In none of these houses has any provision been made for ventilation.

In no case is a scraper, or a mat for the feet provided. In one hundred districts they have no play-ground except the highway, or the land of individuals. In about forty districts a few shade trees may be found within twenty or thirty rods of the school-house. Eighty-nine houses stand in the highway, in all or in part. One district has provided globes for the use of the school, and made arrangements for procuring philosophical and chemical apparatus. Twenty-nine districts have blackboards, and

three have some maps, and one, a clock. All are destitute of a library, thermometer, and recitation rooms. In country districts, the entry serves as a wood-room, and place for hats and cloaks. In country towns, from thirty to fifty scholars are usually crowded into a room calculated for only twenty or twenty-five.

In another county, out of sixty-two school houses, nineteen are located in the highway, and the ground on which the others stand cannot be worth on an average twelve dollars for each. Thirteen are bounded by two roads. Sixteen are in noisy and improper neighborhoods. None have any shade trees, or any of those adornments which are resorted to to make our homes pleasant and healthy. Twenty-six are in good repair; nineteen are much out of repair; one hundred and seventy-six squares of glass are broken; and very few are sufficiently protected from cold air from beneath; twenty-five have crevices to admit the wind from every quarter. Thirty-eight have never been white-washed; none have blinds and other arrangements to admit the proper degree of light; little or no provisions are made for securing habits of neatness and order, by proper places for hats, cloaks, &c. &c.; in forty-eight instances the desks are attached to the walls, so that scholars sit with their backs to the teacher while engaged in their studies; and when they face him they are obliged to lean, if they rest at all, against the edge of the desk for support; in fifty-two, the seats are without backs, and that in most, the seats are not of proper elevation for children of different sizes, nor are they so adapted to the desks that the scholars could write without violating the laws of their organization, and inducing deformity and ill-health; thirty-eight out of the sixty-four are altogether unprovided with the means of ventilation, except through the crevices about the floors and sides of the room.

In another county, out of fifty school-houses taken at hazard from the returns for the county, forty are all or in part in the public highway; twelve are in situations which are wet and disagreeable; not one of these have any play-ground 'except the gardens and orchards' of neighbors; but two are ventilated by an opening in the ceiling; in thirty, the scholars face the walls, or the windows which are in all cases without blinds or shades; in five only are the seats and desks properly arranged and of proper heights, so as to favor the health, the comfort, or the progress of the pupils; and in all, the dimensions of the room are altogether too contracted for even the average attendance of the district.

In another county, out of forty school-houses, but one has any provision for ventilation; but seven have seats with backs in any case; the average height of the school-rooms is seven feet; the average breadth seventeen and a half feet; the average length, eighteen and a half feet, while the average attendance is over thirty children to each.

I have been greatly discouraged by the entire destitution of maps, globes, and other school apparatus; by witnessing among the *small scholars* great suffering, and the probable commencement of disease and deformity, for want of proper support for the back and feet; and an almost entire neglect of those out-door conveniences which a civilized people are said never to forget or allude to. But the ill location of the school-houses, bad seats and desks, the entire want of school-libraries, globes, and (often) of suitable books, might be the better borne with, were not the children shut out from any tolerable enjoyment of the vital air of heaven. Fifty, sixty, or seventy little ones are often crowded together into a close room quite insufficient to give pure air to one quarter of the number."

"As I passed from one school society to another, I had an opportunity to see many of the school-houses; for they stand generally on the high-

way, and some near the travelled path. They are in keeping with the school-houses in other parts of the State. 'They are not beautiful outward,' and in some which I entered I found very little in the internal structure and arrangement to approve. The desks, as usual, are where they never ought to be, against the sides of the school-room and against one end, of the same height for all the children, who want desks, whatever be their size and age. The seats are so high that some of the children cannot get their feet to the floor; and in others the height of the desks and seats are disproportionate. While at these desks, (which are often too narrow.) the children are tempted to be looking out at the windows at every passing object, and are liable at times to be incommoded by the too intense rays of the sun, by the air, or cold; their backs are toward their teacher, and not their faces. In getting over their bench to the desks, and then in turning round from them, they annoy one another and distract the school, while the edge of the desk, often hacked, acts alternately upon the breast and back like a kind of saw-fish. In some instances still, the barbarous custom remains, of seating the little children on benches without backs, raised so high that their feet hang dangling."

The following extracts are taken from official documents, published in 1846 and 1847, and fair specimens of the manner in which school-houses are spoken of, in the reports of local committees, from different parts of the State.

"In one district the school-house stands on the highway, with eighty pupils enrolled as in attendance, in a room nineteen and a half feet square, without any outbuildings of any kind.

In another in the same town, the school-house is less than seven feet high, and the narrow slab seats are twenty-one inches high, (four inches higher than ordinary chairs.) The walls, desks, &c., are cut and marked with all sorts of images, some of which would make heathens blush.

In another, the room is fourteen feet square, and six feet five inches high. The walls are very black."

"In this town there is one of the most venerable school servants in the State. The room is small, and less than seven feet high. Slab seats extend around three sides of the room, and are too high for men. The skill of several generations must have been expended in illustrating the walls with lamp smoke and coal images. The crevices of the floor will admit any quantity of cold air. The door sill and part of the house sill have rotted away. The day I visited it, the teacher and pupils were huddled around the stove."

"In one district, the house stands near the travelled road, is low and small, being only seventeen feet by seventeen, and seven feet two inches high, for the accommodation of sixty or seventy pupils. The seats on the outside are from seventeen to eighteen inches. The walls, door, and sides of the house are disfigured with obscene images."

"There are only three good school-houses in the society; only three that have any out-houses. The rest of the school-houses are in a miserable condition. One is thirty-five or forty years old. Most of them have only slab seats, with the legs sticking through, upwards, like hatchel-teeth, and high enough to keep the legs of the occupants swinging. They are as uncomfortable to little children as a pillory. Seats and desks are adorned with every embellishment that the ingenuity of professional whittlers can devise."

"Two of our school-houses, those in the two largest districts, are in a bad condition, old, unpainted and inconvenient. They are built and constructed *inside* on the old Connecticut plan. Only one row of desks, and that fastened to the wall of the school-room, running quite around it; and long forms, without backs to rest on, the scholars sitting with their backs to the centre of the room. The other two are in better condition, though one is constructed on the same plan as above. The out-buildings are in bad condition generally. One school-house has no out-building nor wood-house. One school-house only is painted outside."

"Of the nine school-houses in this society, not one is really what they all ought to be, for the morals, health, and intellectual improvement of the pupils. Four of them are considered tolerably good, having one out-building, the other five are hardly passable. The desks in most or all of them are where they never ought to be, against the sides of the room and against one end, and with few exceptions, all of a height, with poor accommodations for loose clothes, hats, &c.; all located on or near some highway; no play-ground attached to any of them, except the highway."

MAINE.

EXTRACT *from a special "Report of the Secretary of the Board of Education, upon the subject of School-Houses."*

"It is worthy of note, and of most serious consideration, that a majority of the returns speak of ill-constructed school-houses as one of the most prominent 'defects in the practical operation of the law establishing common-schools.' The strength and uniformity of the language made use of, as well as the numerous applications to the members of the board, and their secretary, for information upon this subject, leave no room for doubt as to the existence of a wide-spread evil; an evil, the deleterious influence of which, unless it is reformed, and that speedily, is not to be confined to the present generation, but must be entailed upon posterity. In remarking upon this subject, as long ago as 1832, it was said by the board of censors of the American Institute of Instruction, that 'if we were called upon to name the most prominent defect in the schools of our country; that which contributes most, directly and indirectly, to retard the progress of public education, and which most loudly calls for a prompt and thorough reform, it would be the want of spacious and convenient school-houses.' From every indication, there is reason to believe that the remark is applicable to our school-houses, in their present condition, as it was when made. For the purpose of contributing, in some small degree, towards effecting a reform for which so urgent a necessity exists, and rendering some assistance, in the way of counsel, to those who are about erecting new school-houses, or remodelling old ones, this report is prepared, under the direction of the board. It makes no claim to originality of thought or language; it is, in fact, a mere compilation of the thoughts and language of others who have given the subject a careful investigation, whose opinions are the result of close observation and long experience, and are therefore entitled to our confidence and respect. To save the necessity of giving credit, upon almost every page of this report, for borrowed language, as well as ideas, it may here be remarked, that the principal sources from which the information herewith communicated has been compiled, are, the reports upon the subject of school-houses, by Hon. Horace Mann and Henry Barnard, Esq., and 'The School-master,' by Mr. George B. Emerson; gentlemen to whom, for their efforts in the

cause, a large debt of gratitude is due from the friends of education; a debt which can be discharged in no manner more acceptable to them, than by entering into their labors, and adopting and reducing to practice their very valuable suggestions."

RHODE ISLAND.

EXTRACTS *from "Report on the condition and improvement of the Public Schools of Rhode Island, submitted Nov.* 1, 1845, *by Henry Barnard, Commissioner of Public Schools."*

"The condition of the school-houses, was, in my circuit through the schools, brought early and constantly under my notice, and to effect an immediate and thorough reform, public attention was early and earnestly called to the subject. The many and great evils to the health, manners, morals, and intellectual habits of children, which grow out of their bad and defective construction and appurtenances, were discussed and exposed, and the advantages of more complete and convenient structures pointed out. In compliance with the request of the Committee on Education, a law authorizing school districts to lay and collect a tax to repair the old, and build new school-houses, was drafted and passed; and in pursuance of a resolution of the General Assembly, a document was prepared embodying the results of my observations and reflections on the general principles of school-architecture, and such plans and descriptions of various structures recently erected, for large and small, city and country districts, and for schools of different grades, as would enable any committee to act understandingly, in framing a plan suitable to the wants of any particular district or school. The same document was afterwards abridged and distributed widely, as one of the '*Educational Tracts*,' over the state. I have secured the building of at least one school-house in each county, which can be pointed to as a model in all the essential features of location, construction, warming, ventilation, seats and desks, and other internal and external arrangements.

During the past two years, more than fifty school-houses have been erected, or so thoroughly repaired, as to be substantially new—and most of them after plans and directions given in the above document, or furnished directly by myself, on application from districts or committees."

"Of these, (three hundred and twelve school-houses visited,) twenty-nine were owned by towns in their corporate capacity; one hundred and forty-seven by proprietors; and one hundred and forty-five by school districts. Of two hundred and eighty school-houses from which full returns were received, including those in Providence, twenty-five were in very good repair; sixty-two were in ordinary repair; and eighty-six were pronounced totally unfit for school purposes; sixty-five were located in the public highway, and one hundred and eighty directly on the line of the road, without any yard, or out-buildings attached; and but twenty-one had a play-ground inclosed. In over two hundred school-rooms, the average height was less than eight feet, without any opening in the ceiling, or other effectual means for ventilation; the seats and desks were calculated for more than two pupils, arranged on two or three sides of the room, and in most instances, where the results of actual measurement was given, the highest seats were over eighteen inches from the floor, and the lowest, except in twenty-five schools, were over fourteen inches for the youngest pupils, and these seats were unprovided with backs. Two hundred and seventy schools were unfurnished with a clock, blackboard, or thermometer, and only five were provided with a scraper and mat for the feet."